

Publications of the

National Bureau of Economic Research, Inc

Number 40

National Income and Its Composition, 1919–1938

THE UNIVERSITY GEOGRAPHICAL SERIES

GENERAL EDITOR

L DUDLEY STAMP, BA, DSc, ALC, FRGS, MIPT

EUROPE

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[Photo Margaret R Shackleton]

FIG 1 —THE DORON VALLEY, NEAR PRALOGNAN LA-VANOISE, IN THE ALPS OF SAVOY

Europe has a greater percentage of its area under cultivation than any other continent and a smaller percentage of unproductive land. This photograph shows intensive cultivation at a height of 4 600 feet on the valley floor while above the unproductive valley-walls with their limestone scree, are summer pastures for sheep, goats and cattle.

EUROPE

A REGIONAL GEOGRAPHY

BY
MARGARET REID SHACKLETON, B A (LOND)
FORMERLY LECTURER IN GEOGRAPHY AT UNIVERSITY COLLEGE, LONDON

THIRD EDITION

WITH NUMEROUS MAPS AND ILLUSTRATIONS

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55 FIFTH AVENUE, NEW YORK
221 EAST 20TH STREET, CHICAGO

LONGMANS, GREEN AND CO
215 VICTORIA STREET, TORONTO

FIRST PUBLISHED *July 1934*
SECOND EDITION *December 1936*
THIRD EDITION *October 1939*
NEW IMPRESSION *February 1942*

CODE NUMBER 81241

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Printed in Great Britain by William Clowes & Sons, Limited, Beccles

PREFACE

THIS book is intended primarily for University students, but the needs of the more general reader have also been kept in mind. The treatment is fundamentally physical, for the author believes that a knowledge of structure is even more necessary to the geographer than a knowledge of anatomy to the artist, and that the physiognomy and form of the earth's surface are incomprehensible without a knowledge of the solid bones of structure beneath. But since this is a geographical and not a geological work, an attempt is made not only to correlate structure with relief, but also relief with climate and all three with vegetation, and so to indicate the main aspects of the whole natural environment in each region. It is not assumed, however, that men are compelled to act in any particular way by their natural environment, but that the various opportunities offered to them by nature can be dealt with in various ways, according to the stage and type of culture which has been attained, the word "culture" here being used in the anthropological sense.

As regards the arrangement of the material, a compromise has been made in the regional section between a division based solely on natural regions, and one based solely on political divisions. In a continent such as Europe with a long historical past one cannot ignore the differences between the various countries which are due in turn to differences of historical or historico-economic development. One country may differ greatly even from its neighbour not only in language but in the stage of social and economic evolution, so that regions closely similar in physical aspects may yet differ markedly in their human activities and in the use made of their

resources. Contrast, for instance, Germany and Poland, Finland and Russia, Spain and Italy. If, however, each of the many countries were to be treated as an isolated unit, one would be apt to lose sight of the broad patterns of structure, relief, and climate which dominate the continent. Accordingly, for the purpose of this book, Europe has been divided into a number of large regions, based primarily on similarities of climate and structure, but also partly on historico-economic affinities. The old-established countries of Europe have also been treated individually in separate chapters.

A detailed regional account of the British Isles has been omitted in view of the easy accessibility of the material in other publications, but a general survey of the structure and climate will be found in the introductory chapters. As, however, the Industrial Revolution in England had so much influence on the rest of the continent, a brief account of its origin and dissemination has been given.

I should like to take this opportunity of expressing my very sincere thanks to those authorities, both in Cambridge and elsewhere, who have given me invaluable assistance in the preparation of this book. Professor O. T. Jones, F R S, read the chapter on Structure and Relief and made many helpful suggestions in regard to its contents, and Mr J A Steers, M.A., did the same for the chapter on the Alpine Region. Dr. C. E. P. Brooks read the chapter on Climate and also very kindly had the isotherm maps of Europe drawn for me from the latest material available at the Meteorological Office. Professor E. J. Salisbury, F R S, read the chapter on Vegetation, Mr. R. Aitken the chapter on Iberia, Miss I. J. Curnow, Ph D, the chapter on Greece, and Mr. A. Stevens, M A., the sections on Fennoscandia and South-Central Europe. I have pleasure also in thanking Professor J. H. Clapham for helpful suggestions in regard to the economic history of Western Europe, and Dr. L. Dudley Stamp for general help and advice. My deep gratitude is due also to Professor F. Debenham for the kind permission he so readily gave me to use the Library and Map Room

of the Geography Department of the University of Cambridge

The photographs reproduced in the book have been supplied for the most part by the various Embassies, Legations, and their Travel Agencies, and in most cases were specially procured for me from the countries concerned. Permission to reproduce the photographs from the *Journal of Ecology* was given by the Editor, Professor A. G. Tansley, F.R.S., and is very gratefully acknowledged. The Spanish photographs were most kindly lent by Professor Hernandez Pacheco of the University of Madrid.

Finally, I wish to express my deep indebtedness to Mr W. G. East, M.A., and to Miss Alice Garnett, B.A., for undertaking the arduous task of reading the proofs.

MARGARET R. SHACKLETON
(MRS F. G. MANN)

CAMBRIDGE, 1934.

PREFACE TO SECOND EDITION

IN this edition the statistics and other facts have been brought up-to-date, some new material has been added in the text, several of the production tables have been enlarged and the reference lists have been extended by the addition of recent publications of importance. The map of the administrative divisions of Russia has been entirely redrawn to show the new (1935) boundaries, so that students can use it as a basis for detailed work involving official statistics, etc.

A few changes have also been made in accordance with recommendations received from correspondents abroad, to whom the author would like to express her sincere thanks. She would be particularly grateful for any further suggestions or criticisms which would serve to improve the book and add to its usefulness.

M. R. S.

1936.

PREFACE TO THIRD EDITION

STATISTICS have again been brought up to date and the necessary emendations have been made consequent upon the merging of Austria with Germany and the dissolution of Czechoslovakia. A considerable amount of new material on South-Central Europe has been added, more particularly in connection with Hungary and Rumania. The lists of reference books have been carefully revised.

I should like to take this opportunity of thanking Dr. Vladimír Novák for his kindness in sending me very detailed and helpful criticisms. Most of his emendations and suggestions I have been able to incorporate in this third edition.

M. R. S.

1939.

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PART I—GENERAL SURVEY

INTRODUCTION

TAKEN as a whole, Europe may be looked upon as the most favourable continent for mankind. It contains a greater proportion of land suited to agriculture than any other continent, and, unlike the others, has practically no desert. Its mineral wealth is considerable and varied, and it is especially rich in coal and iron. Its mountain chains, though high, are not impassable barriers, and, moreover, the continent is deeply penetrated by arms of the ocean such as the Baltic, Mediterranean, and Black Seas, so that in proportion to its area it has the longest sea-coast of any continent, and therefore the greatest opportunities for ocean transport, the most economical form of bulk conveyance. Although Europe on the north extends well within the Arctic Circle, yet the winters are remarkably warm for these high latitudes, especially in the north-west, so that settlement and cultivation have here been carried nearer the Pole than anywhere else in the world. The great diversity of environment, especially west of Russia, gave opportunities for the accumulation of different types of experience and for the active exchange of goods and ideas. The early development of civilisation in Europe, its active intellectual life throughout the ages (with only short periods of stagnation), its present thickly populated surface, and the spread of Europeans and European ideas over the whole world all reflect the favourable nature of the environment for man.

Size.—In spite of its importance Europe is almost the smallest of the continents, with a total area of 3,873,000 square miles. Only Australasia is smaller, while Asia is nearly five times as large. Indeed, it has often been said that physically Europe is a mere peninsula of Asia.

Position.—The most northerly point of the mainland of Europe is Cape Nordkyn in Norway, $71^{\circ} 8' N$, and the most southerly is Cape Tarifa in Spain, $36^{\circ} N$. The islands give the continent only a slightly greater extension, the North Cape on the island of Magero being $71^{\circ} 15' N$, and the southern coast of Crete about $35^{\circ} N$. Europe has thus a smaller extension in latitude than the other continents, with the exception of Australasia.

In relation to the disposition of the main expanses of land and water in the world, Europe is fortunate in being placed in the middle of the land hemisphere (*see* Fig. 2), and therefore is centrally situated in the inhabited half of the globe, whereas its antipodes, in the islands of the South Pacific, are situated far from the main centres of

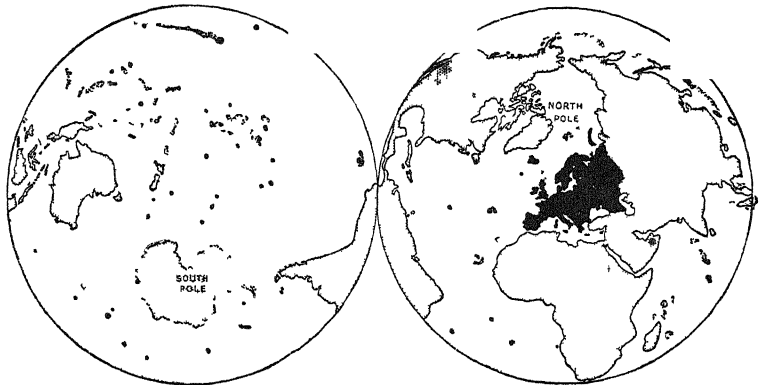


FIG 2—LAND AND WATER HEMISPHERES, SHOWING THE FAVOURABLE POSITION OF EUROPE

human life. Paradoxically, however, Europe combines the advantages of this mid-land position with easy access to other parts of the globe by sea.

Boundaries.—On the north, west, and south, Europe is bounded by the sea, which forms an unmistakable frontier even where narrow, but on the east it merges into the Asiatic mainland, and here its limits are artificial. The eastern boundary was indeed extended successively towards the north-east as the knowledge of the area increased, but has never been considered very satisfactory. The Ural Mountains, stretching from north to south, appear to make a convenient boundary when seen on a small-scale map, but actually they are low, easily crossed in many places, and form a relatively slight physical barrier.

They have never formed a political frontier. Between the Urals and the Caspian Sea lies a stretch of plain some 300 miles wide in which there is no natural boundary, and which has repeatedly proved a zone of easy movement for invaders from Asia. In default, however, of better boundaries, the Ural Mountains, the Ural River, and the Caspian Sea may be taken as the eastern limits of Europe, together with the Caucasus Mountains. The latter, which fill the gap between the Caspian and Black Seas, form a climatic divide and a barrier to the movements of peoples, and have more claim to be considered as a natural boundary than the Manych depression, which used to be accepted as the frontier of Europe in the region between these two seas.

CHAPTER 1

STRUCTURE AND RELIEF

EUROPE is almost equally divided into two great physical regions, an eastern and a western. Even from a small-scale atlas-map it is possible to perceive the contrast between the great monotonous plain of eastern Europe and the varied relief of the rest of the continent, where there is a rapid alternation of mountain and valley, hill, plain and plateau. This contrast is primarily based on differences of structure, since Europe east of the Carpathians has a structural simplicity in marked contrast to the complexity of the rest of the continent, and this again is based on differences of geological history, since eastern Europe has been a region of great structural stability through vast eras of geological time, whereas western Europe has experienced great earth-storms which have raised up four great mountain systems at different times.

Eastern Europe.—This region, sometimes called the Russian platform, is built up of sediments, ranging in age from Palæozoic to Tertiary, which have remained almost undisturbed since the strata were laid down beneath the sea. A small amount of faulting took place and sufficient warping to give rise to gentle swellings and depressions. These slight undulations in turn allowed the work of erosion to denude the more recent deposits from the broad upswellings, thereby exposing wide surfaces of the Mesozoic and Palæozoic strata and partially filling up the depressions, so that before Mid-Tertiary times a low plain of denudation was produced which extended across all formations. The whole area later underwent a slight positive movement or bodily uplift *en masse*, which resulted in the present moderate height and in a rejuvenation of the river system—that is to say, the erosive power of the rivers was increased in consequence of the increase of gradient. The general relief of the plain, a good deal of which lies between 600 and 1,000 feet, remained, however, almost as monotonous as before. There are, it is true, occasional developments of escarpments, and of hills composed of morainic material deposited in Quaternary times on the edge of vanished ice-sheets, but in

general the change of level is so gradual that the effect of sameness remains. The river valleys form the main breaks in the continuity of the plain since their courses are often rather deeply incised, but as the valleys are not

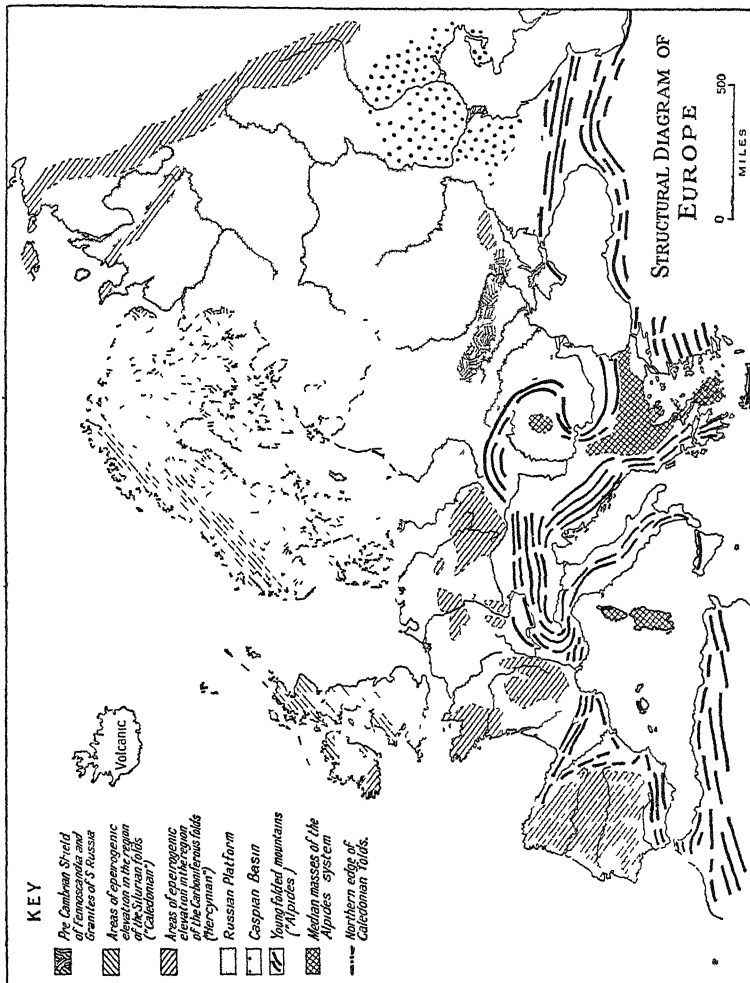


FIG. 3—STRUCTURAL DIAGRAM OF EUROPE

obvious until the brink is almost reached, they cannot be said to form marked breaks in the landscape

The crustal stability of this large area is unique in Europe and contrasts vividly with the complicated

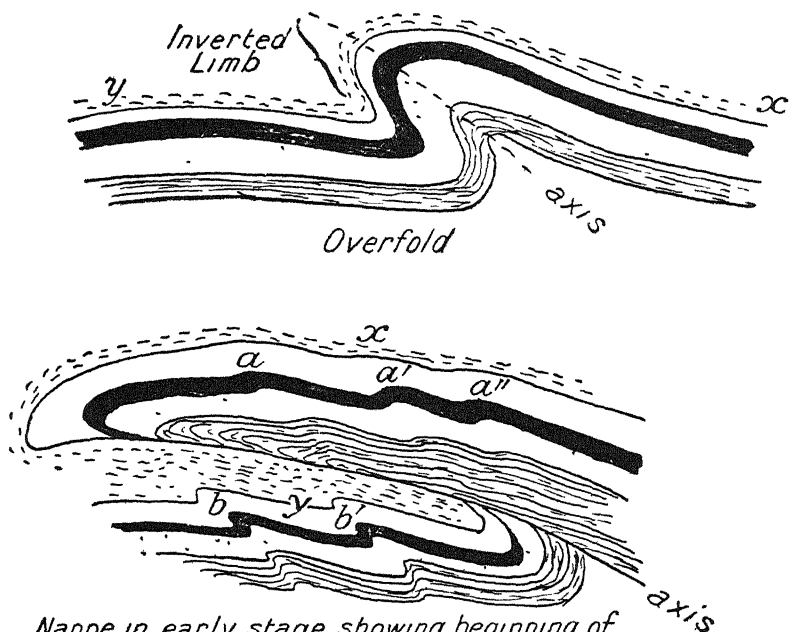
geological history of the rest of the continent. Even here, however, there are one or two exceptions. Folded strata are met with in the Donets plateau in southern Russia, and in the area between the Rivers Bug and Dniester denudation has advanced sufficiently far to bring to light in the valleys the ancient gneisses and granites which form the Archæan floor to the platform. Also, the Ural Mountains, which border the eastern edge of the Russian platform, are a folded range raised up in Palæozoic times.

The Folded Mountains of Europe.—These belong to four main cycles of folding, the earliest of which took place in Pre-Cambrian times. Next came the Caledonian in late Silurian and early Devonian times, followed by the Hercynian in Permo-Carboniferous times, and finally by the Alpine in Tertiary times. The mountains raised by the Alpine *orogen* in Eurasia are sometimes known as the Alpides, but more often simply as “young folded mountains.” With the exception of the first two, which may overlap to some extent, the great mountain chains were raised up successively farther south, so that the youngest mountains of Europe border the Mediterranean, those of medium age are in mid-Europe, and the oldest are in the north. All except the young folded mountains have been eroded down to their very stumps, and owing to subsequent depression beneath the sea have been covered by great thicknesses of younger material. Their reappearance above sea-level has occurred generally at a late geological period, and may be connected with the great earth disturbance which raised up the young folded mountains in Tertiary times.

Generally speaking, only fragments of the older mountain systems are visible on the surface, while the young folded mountains form long unbroken mountain chains and are generally of higher relief. As the young folded mountains, or European Alpides, are the most recent, and have the appearance at the present day once possessed by the older mountain systems of Europe, we begin with a short account of their mode of origin. This will help towards an understanding of the nature of the older ranges.

These young folded mountains comprise the chains bordering the Mediterranean Sea in Spain, in Italy, and in the Balkan Peninsula, also the Pyrenees and the great arcs of the Alps and Carpathians, the Balkan range, and the Crimean Mountains. They continue eastward into Asia to the Himalayas and beyond, and the Atlas Mountains of Africa also belong to the same great system. *

Before the young folded mountains were raised there existed an ancient sea called by geologists "Tethys," far wider than the present Mediterranean, lying between and partly upon the old continents of "Africa" and "Eurasia." These two proto-continents may be looked upon as consisting of solid resistant masses of old compacted rocks, but the floor of the sea between them was covered with marine sediments which were relatively much less dense



Nappe in early stage showing beginning of digitation at $\alpha, \alpha', \alpha''$ and β, β' . Note that inverted limb has disappeared.

FIG 4—DIAGRAMS SHOWING THE DEVELOPMENT OF A NAPPE FROM AN OVERFOLD.

and more flexible. For some reason as yet not fully explained, the old continents began to move towards one another, and as a result the sediments of the sea between them were buckled into a number of folds. These at first were probably simple, but as the pressure increased the folding became more intense, and ultimately successive folds were piled upon one another. They may be described as earth-waves breaking upon the resistant shore of the old continent of Europe. The resulting mountains are therefore of extreme complexity; the

folds are of the type described as recumbent, in which the lower limbs are completely inverted so as to lie horizontally under the upper limbs. In many cases the folds were torn off from their roots and were thrust forward to the north, and there piled up on top of other folds. Recumbent folds of this type are known as *nappes* in French and *decken* in German, but there appears to be no English equivalent. The process of their formation can best be explained by means of a diagram. (See Fig. 4.)

These nappes were first recognised in the Swiss Alps and have since been identified in the Betic Cordillera of Spain, the Apennines, Carpathians, and young folded mountains of the Balkan Peninsula. As each nappe consists of layers of stratified rock of different types and ages, denudation produces a rapid alternation of outcrop, though long, narrow bands of one type of material run generally in the direction of the length of the chain. In some areas denudation has taken place to such a depth as to expose lower nappes, which are revealed in what are called "windows"; in other areas whole nappes have been removed altogether. The elucidation of the structure of these young folded mountains is therefore a matter of great difficulty. The geographer, however, who is studying the earth primarily as the home of man, may be content to know the broad outlines of the geological hypotheses referred to above, and to turn to a study of the position and height of these mountains and to the actual material of which they are composed.

The sediments which were folded to form these young mountains were accumulated in seas of moderate depth, and consist mainly of limestones (see Chapter XXIII). The more deep-seated layers, which were, however, subjected to enormous pressure, have generally undergone metamorphism and have become crystalline. Where denudation has advanced sufficiently far these crystalline metamorphic rocks have been exposed, but most of the chains of the Alpides include a considerable proportion of limestones of various ages, ranging from Triassic to early Tertiary. As the folds rose from beneath the sea, shallow-water deposits were laid down, particularly on the outer side of the ranges, and were usually of sandstone and clays known as *Flysch*. In the Western Alps denudation has advanced so far that the original surface beneath all the nappes has been exposed in certain areas, whereas in the Apennines there is a large development of rocks of *Flysch* type and of Cretaceous limestones. In the Alpides as a

whole, however, so much material has been removed by denudation that the mountains would have been reduced to low ranges at the present day if an upward movement *en masse* had not occurred. Such a movement is termed "epeirogenic" in contrast to the "orogenic" or folding movement. It probably took place towards the close of the Tertiary and the beginning of the Quaternary.

The mountains raised by the Alpine movement show a marked tendency both in Europe and Asia to extend in long arcs round interior basins. It is supposed by some that these arcs were formerly more continuous with each other, but have become separated through a sinking of intervening areas. For instance, the Alps and Carpathians are now separated by the depression traversed by the Danube near Vienna. As, however, the direct evidence lies beneath the sea or beneath great depths of later sediments, reconstruction is a matter of conjecture, though close petrological study of the rocks and of the direction of thrust of the nappes is clearing up some of the difficulties while destroying some of the earlier hypotheses. Thus, it is no longer held that the mountains of the Rif in North Africa were once connected with those of the Sierra Nevada by intervening mountains which have disappeared. Different theories of the connection between the young folded ranges are given in diagrammatic forms. (See Fig. 5.)

There are rival theories also to account for the position and direction of the fold ranges, though it is agreed that the

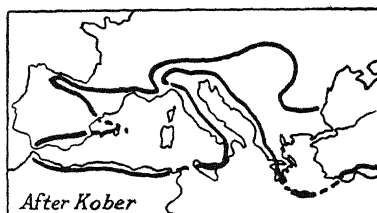
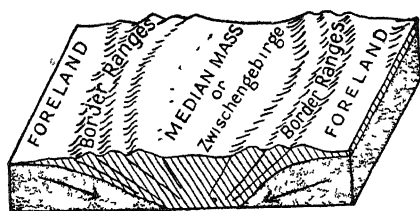


FIG 5—SUGGESTED RELATIONSHIPS
BETWEEN THE YOUNG FOLDED
MOUNTAINS OF EUROPE

spread of the Alps and Carpathians northwards was limited by the solid resistant masses of old rocks which formed the stumps of the Hercynian system. There are various explanations, moreover, of the areas between the folded ranges which were apparently not affected by the Tertiary folds, such as the great depressions of the Hungarian (Pannonian) basin, and of the Western Mediterranean, or the old mountain masses of the Rhodope in the Balkans. Perhaps Kober's theory of the unfolded "Median Mass" or *Zwischengebirge*, is the most convincing (see Fig. 6). In the case of the Alps, however, this unfolded Median Mass does not exist owing to the intensity of the earth movements. Possibly the present width of the Mediterranean is due to a recent northward drift of Europe away from Africa. It is agreed, however, that the regions included within the great arcs of folding are part of the young folded mountain system, though they themselves were not subject to folding in Tertiary times.

As far as elevation is concerned the highest mountains of Europe are to be found in the young folded mountains. Thus Mt Blanc (15,782 ft.), in France, is the highest peak and the Alps have the greatest average height.



[After Kober]

FIG. 6—BLOCK DIAGRAM SHOWING A "MEDIAN MASS" (ZWISCHENGEBIRGE) BETWEEN FOLDED RANGES

The great chains of the young folded mountains have naturally a great influence on the lines of communication in Europe, without, however, being the insuperable barriers which they might appear at first sight. The manner in which they closely border the Mediterranean Sea makes com-

munication inland from the south a difficult matter and concentrates attention on the few gaps which exist between the ranges. Of these gaps there are two of outstanding importance, firstly, that formed by the Rhône-Saône Valley, and secondly that formed by the Dardanelles, Sea of Marmora, and Bosphorus. Besides these there are two other important routes which also lead from the southern sea to the northern plains, the first over a rather difficult saddle connecting the head of the Adriatic behind Trieste and Fiume with the middle

Danube (Pannonian) plain, and the second a long and tortuous route from the Ægean to the same plain *via* the river valleys of the Morava and Vardar. The Alps themselves by their height and length offer a great obstacle to transport, but they possess a large number of passes, which, if not easy for road construction, at least are not insuperably difficult. Also their high but narrow chains can be evaded by tunnels, which, though of great length in several cases, do not offer difficulties beyond the skill of European engineers, and are not uneconomic in a rich and civilised continent.

North of the young folded mountain zone are fragments of other folded ranges of much earlier geological date which probably were formed in much the same way as the Alpides, and were once equally continuous and extensive. (See Fig. 3.)

Immediately to the north of the young folded zone lie the relics of the Hercynian mountain system which was raised up in late Palæozoic times at the end of the Carboniferous period. It extended from what is now western Iberia and Ireland through central France, Germany, and Bohemia to Poland, presumably forming festoons or arcs similar to those of the Alpides. A prolonged period of denudation reduced these mountains to peneplanes, and by a gradual invasion of the then continent by the sea, the peneplaned roots of the old mountains were covered by thick deposits of limestones and sandstones of the Permian, Triassic, Jurassic, and Cretaceous periods. The old land-masses were most fully submerged in Cretaceous times, and it is probable that very few remnants of the Hercynian system stood above the sea during that period. At the end of Cretaceous times there was a recovery, and in mid-Tertiary times there were large areas of low peneplane whose surface was in places covered by lagoons, in which were formed brown coal deposits.

A further recovery of land then took place which was associated with the earth disturbances involved in the building up of the Alpides to the south. The earth-storm, however, was generally unable to cause much folding of the resistant stumps of the Hercynian mountains, but they were exposed to severe pressures, to such an extent that numerous great fractures were developed, both in the old rock and the younger overlying sediments. Sometimes, also, there was slight warping, but generally any disturbances to which they have been subjected were due to

uplifts of segments of the old chains as blocks or *horsts*, accompanied by a general positive movement of the land. As certain segments of the old chains rose higher than others, denudation began to strip off the Secondary and Tertiary sediments from the uplifted portions and to lay bare the old peneplane surfaces of the Hercynian stumps. Owing to the slowness of denudation in these older and more resistant rocks, the former peneplanes are still recognisable, and rounded forms are the rule. In the depressions between these *horsts* or blocks the younger sediments were preserved, usually slightly tilted in conformity with the movements of the Hercynian floor. Erosion, working on comparatively thin strata of different resistances, has led to a great development of scarplands, which are a feature of the more low-lying parts of the Hercynian zone. Consequently there is a great variety of relief in the region affected by the Hercynian system, *horsts* of old crystalline and metamorphic rocks alternating with plains and low plateaus of clays, sandstones, and limestones.

The Hercynian zone disappears in the west and north under the waters of the Bay of Biscay, the English Channel, and North Sea, and under the recent sediments of the Germano-Polish lowland. It is met with again in the British Isles.

The north-western part of Europe represents the stumps of two still older mountain systems. The Caledonian system is now represented by two segments, one occupying the north-western part of the British Isles and the other forming the highland backbone of Scandinavia (Norway and Sweden). Formerly these must have been connected across the North Sea. It is not necessary here to trace their long and complicated geological history, which may be treated briefly together with the Archæan floor on which they stand. This Archæan floor emerges from beneath the unfolded sediments of the Russian platform on the border between Russia and Finland, and on the south from beneath the Baltic. It is composed of crystalline rocks such as gneiss, granite, and crystalline schists, and evidently represents the roots of a vast primeval mountain system. Traces of unfolded Palæozoic sediments indicate that strata similar to those of the Russian platform once covered Finland and the greater part of Sweden. On the western borders of Sweden, however, and over the greater part of Norway, Silurian and earlier rocks were folded by

the Caledonian movements. It is possible that the greater part of Scandinavia and Finland has been above sea-level since Devonian times, but the present elevation is due to an epeirogenic uplift, probably in middle or late Tertiary times, which tilted up the western side of Scandinavia to form the present lofty mountains. These, like the *horsts* of the Hercynian system, are in reality a dissected peneplane, but the tilting was more uniform than in the Hercynian region. The Highlands of Scotland had a somewhat similar history. Old folded mountain

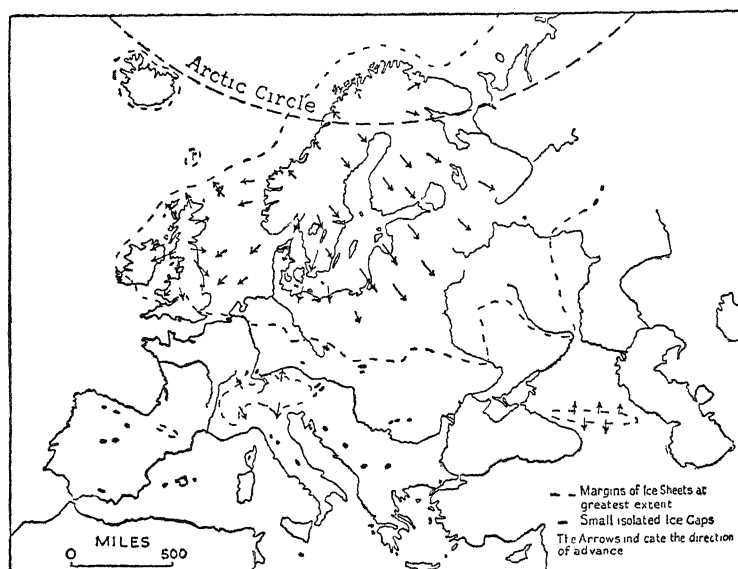


FIG 7—THE QUATERNARY GLACIATION OF EUROPE

chains were eroded to a peneplane which was subsequently uplifted so that the rivers were rejuvenated and the work of erosion hastened, resulting in the formation of deep valleys.

Quaternary and Recent Events.—The northern part of Europe, particularly the highlands of Scandinavia and Scotland, preserves abundant evidence of one of the most recent episodes in the geological history of Europe, namely, the great Ice Age of the Quaternary period. The cause of the Ice Age is controversial, but there is no doubt that a great cap of ice, similar to those now covering Greenland and Antarctica, developed over

Scandinavia and pushed its way out across the North Sea and Baltic into the bordering lands of Russia, North Germany, Poland, and the eastern coast of the British Isles. Similar but smaller ice-sheets-developed in north-west Britain and on other mountainous regions, particularly the Alps.

The main effects of the Ice Age in northern Europe were to sweep great quantities of the loose soil from the highlands of Scandinavia and to deposit masses of unconsolidated material on the lowlands, to the south, particularly on those of Denmark, northern Germany, and Poland, whilst a similar process took place on a smaller scale in the British Isles. In the Alps the Ice Age made a profound impression on the range, transforming it from a region of mild curves to one of sharp peaks and "horns" that we look upon as typically Alpine (See Chapter XXIII.)

Since the great Ice Age minor oscillations of level have taken place in numerous areas which show that the European continent is far from stable. The presence of active volcanoes in southern Europe and the frequency of earthquakes in certain regions indicate zones of specially marked instability.

REFERENCES

(This short list of books and those given at the end of subsequent chapters are intended for the guidance of students, and are not to be taken as complete bibliographies)

The Physiographical Evolution of Britain, by L. J. Wills (1929), gives a good account of the building of Europe, its scope being far wider than its title implies. See also *The Unstable Earth*, by J. A. Steers (London, 1932)

Much useful material on land-forms is to be found in *Traité de Géographie Physique*, by E. de Martonne (3 vols. Paris, 1925), and in *Physiography*, by R. D. Salisbury (London, 1924), and in *The Physical Basis of Geography*, by S. W. Wooldridge and R. S. Morgan (London, 1937)

The Origin of Continents and Oceans, by A. Wegener, translated by J. G. A. Skerl (London, 1924), and *The Surface History of the Earth*, by J. Joly (Oxford, 1925), deal with the causes underlying earth movements. (See also References at the end of Chapter XXIII)

The Quaternary Ice Age, by W. B. Wright (London, 1937), and *Das Eiszeitalter*, by P. Woldstedt (Stuttgart, 1929), deal at length with the Ice Age in Europe

Useful books dealing with the composition of the rocks are *The Principles of Petrology*, by G. W. Tyrrell (London, 1926), *Deposition of the Sedimentary Rocks*, by J. E. Marr (Cambridge, 1929), *The Study of Rocks*, by S. J. Shand (London, 1931), *The Elements of Economic Geology*, by J. W. Gregory (London, 1928), deals mainly with the origin and distribution of minerals.

CHAPTER II

CLIMATE

LYING entirely outside the Tropics, and with but a small proportion of its area inside the Arctic Circle, Europe is often said to have a temperate climate. Since, however, Europe includes places, *e.g.* Moscow, which show a difference of over 50° F. between their mean temperatures in July and January, and a difference of over 140° F. between their absolute maximum and minimum temperatures, the word "temperate" is hardly suitable, and some other term such as "mid-latitude" might be used, though it is better to avoid any such general term, as the climate of a continent of nearly four million square miles must naturally vary greatly from place to place, according to differences of latitude, altitude, the direction of the prevailing winds, and the position in regard to other land-masses and to the ocean.

Large as Europe is, however, it is small compared with the vast unbroken expanses of land and sea which adjoin it, and climatically it is dominated by systems of air circulation which are centred over Asia and the Atlantic Ocean. On charts showing average pressure conditions for winter and summer, Europe is seen to be under the influence of four main pressure-systems, the Icelandic "Low," the Siberian "High," the Azores "High," and the south-west Asiatic "Low." The Icelandic "Low" is specially intense in winter and the Azores "High" in summer, the Siberian "High" exists only in winter and is replaced by low pressure in summer, while the "Low" of south-west Asia exists only in summer. In outline the average distribution of pressure and its causes appear quite simple, and are explained in every school text-book on the subject; but when this average is considered as being made up of a constantly changing sequence of cyclones and anticyclones—in other words, as representing a dynamic and not a static condition—the whole matter takes on a more complicated aspect.

The real cause of cyclones is not exactly known, but they are believed to originate in the efforts to

escape southwards of air accumulated over the Polar regions, especially over Greenland. The cyclones of mid-latitudes, or, as they are now often called, depressions, move usually from west to east and are more frequent in winter than in summer. Their centres show a preference for certain paths, particularly, as regards Europe, a path which traverses Iceland and skirts the north-west coast of Norway, and, in winter only, a path along the Mediterranean Sea. In summer the latter route has few cyclones, and in both seasons the Alps tend to be a climatic divide.

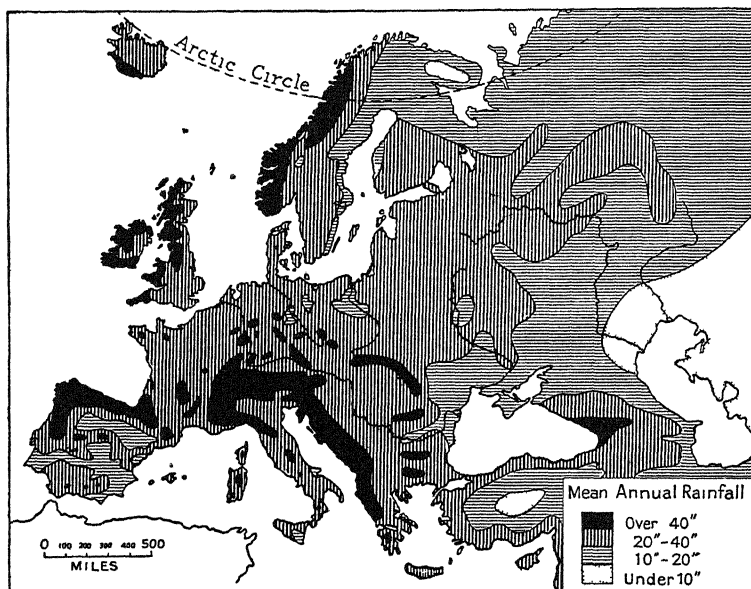


FIG 8—RAINFALL MAP OF EUROPE.

Cyclones are by no means confined to these tracks, however, but cross the continent and enter Russia fairly freely, though they are usually less intense and less frequent over the more continental parts of Europe, as the friction of the land-mass causes the winds to turn inward and the depression accordingly begins to fill up. Almost all the winter precipitation of Europe is cyclonic, though the actual amount varies with relief as well as with the intensity of the cyclone and with the amount of water vapour available, but some winter precipitation on mountainous districts is also purely orographical. In summer, thunderstorm rain augments cyclonic rain, especially in

central and eastern Europe; but thunderstorms are themselves frequently associated with cyclones, particularly with secondaries.

The main climatic characteristic of areas in mid-latitudes traversed by cyclones is the great variety of weather, associated with frequent changes of wind direction, the consequent alternation of warm and cold spells and the frequency of rain. No part of Europe lies entirely outside the cyclone belt, but southern Europe lies outside it in summer, when it comes within an anticyclonic zone of

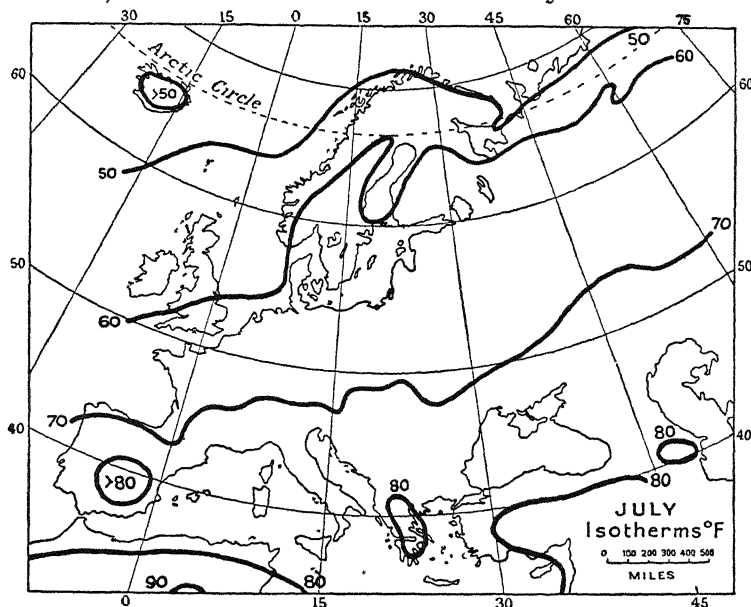


FIG. 9—JULY ISOTHERMS OF EUROPE.

steady northerly winds, often known as the Trades, though in the Mediterranean region they are usually only light, gentle airs. The summer climate of the Mediterranean area differs greatly from that of the rest of Europe in being markedly more stable, subject to little change, and of pronounced dryness. The more frequent the cyclones and the greater their intensity the greater is the variety of weather, so that the Atlantic margins have the most changeable climate of Europe, and, apart from the Mediterranean region in summer, the east of Europe has the least changeable, though the actual range of temperature changes is greater.

A division of Europe into regions having a Mediterranean, continental, and oceanic climatic régime is a familiar one to all students of geography. No sharp lines mark the boundaries of these divisions, but the region of Mediterranean climate is more sharply marked off from the other two than the oceanic and continental are marked off from each other. This is mainly because the Mediterranean region lies outside the cyclonic belt in summer and so has summer drought, whereas the rest of Europe has precipitation all the year round. This combination of winter rain and summer drought has given rise to a vegetation association also known as Mediterranean, and where the Mediterranean climatic régime ends the typical vegetation cover also disappears, so that the boundaries of the Mediterranean climate are fairly easily discernible. On the contrary, there is no marked association of vegetation zones with the continental and oceanic climatic régimes, the coniferous and deciduous forest belts being continued from one to the other, though the beech avoids the severe winters of the continental climate.

The change from the oceanic to the continental climatic régime takes place very gradually. The former is distinguished by the small range of temperature between summer and winter and between day and night, the large number of rain days which are very evenly distributed throughout the year, and by great changeableness. The latter is distinguished by the larger range of temperature (the annual range amounting to 40° F. or more), the smaller number of rain-days, an increasing tendency as one goes eastward for the rainfall to be concentrated in the summer months, and by greater stability. North of the Mediterranean lands, the whole of Europe between the western oceanic margins and Russia may be looked upon as transitional in character between an oceanic and continental climatic régime. It is indeed to some extent a matter of opinion as to what type of climate prevails in central Europe; for instance, an Englishman would probably consider the climate of the Rhine rift valley to be continental in type, whereas a Russian would think of it as oceanic.

The Mediterranean Region.—The isobaric map of average pressure in January shows that the Mediterranean basin is a region of low pressure in winter, and that it lies between a tongue of high pressure which extends westwards from the Siberian anticyclone across central Europe and a belt of high pressure which stretches across northern Africa. This low-pressure trough indicates that the

Mediterranean Sea forms a favourite path for the passage of cyclones, as already indicated, but they tend to follow the northern rather than the southern shore, so that the European side is rainier than the African side. As the south-west surface air current in cyclones is the chief rain-bringer it follows also that the western side of each peninsula has a heavier precipitation than the eastern. The existence of rather large expanses of land in the Iberian and Balkan peninsulas tend to hinder the free passage of cyclones, with the result that in winter the

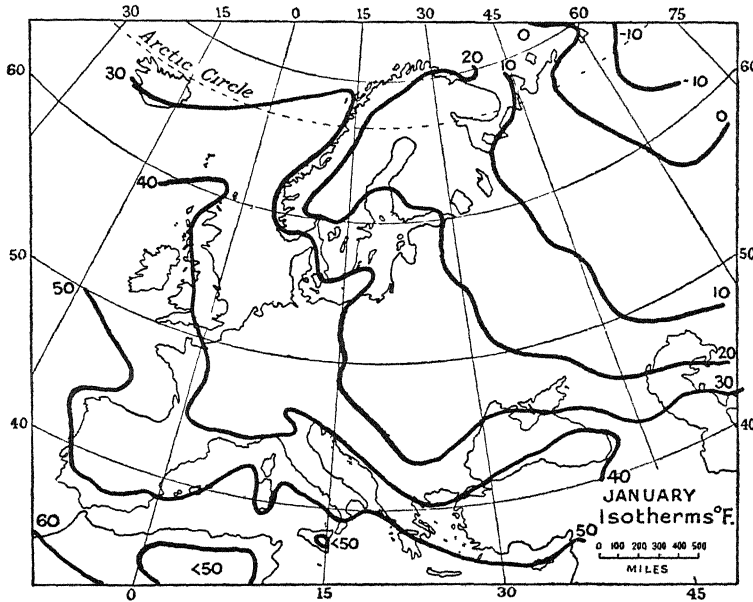


FIG 10 — JANUARY ISOTHERMS OF EUROPE.

interior of these areas is drier than the lands margining the Mediterranean Sea.

The isobaric map of average pressure in July shows the western part of the Mediterranean basin to be under the influence of the Azores anticyclone, while the south-eastern part lies on the outskirts of the "Low" of south-west Asia. Winds are northerly over the whole basin, and there are rarely any cyclonic disturbances. The winds are, however, usually light, except in the eastern Mediterranean, where the pull of the "Low" of south-west Asia gives great strength to the northerly winds, famed in antiquity as the "Etesian." Except where the strong

Etesian prevails, the absence of marked air currents allows the development of land and sea breezes

Average sea-level temperatures for January vary from about 55° F. in the extreme south (*e.g.* Gibraltar, Sicily) to 44° F. or rather less on the northern coasts, but the high interiors of Iberia, Italy, and Greece naturally have lower temperatures (*cf.* Madrid), while above 4,000 feet or so in the south and 3,000 feet in the north the average January temperature is usually below freezing, and precipitation comes in the form of snow. In summer the average sea-level temperatures for July are high, reaching over 80° F. in southern Spain and about 80° F. in the southern parts of the other peninsulas, and rarely falling below 70° F., even the mountains being regions of heat and drought. Unlike the temperatures, which show no great contrasts, the actual amount of rainfall varies very much from place to place. The south-eastern coasts of the peninsulas have generally a low rainfall, often less than 16 inches, but the mountains on the north-western coasts have exceptionally heavy rainfall, especially the high Dinaric Alps; Crkvice, above the Bay of Cattaro, having an average annual rainfall of 183 inches, which is about the same as that on the exposed mountains of north-west Europe.

Fig. 11 shows the approximate limits of the Mediterranean climatic régime, and the tables at the end of this chapter give the most important climatic statistics for various towns. There are, however, important aspects of the climate of an area which are not very obvious from the study of such tables, or which are apt to be misinterpreted by dwellers in a different type of climate. For instance, it is usually assumed by residents in other parts of Europe that the Mediterranean climate is an enervating one, but Algeria has been described as "a cold country where the sun is hot," and the same may be said of most of the Mediterranean lands for nearly three-quarters of the year. The omnipresence of high mountains provokes a generous fall of snow in the winter months, and the snow often lies well into the spring. For instance, the mountains of the Abruzzi (*c.* 42° N.) often carry snow in May, Mt. Olympus (*c.* 40° N.) and Mt. Etna (*c.* 38° N.) also have a snow-cap for the greater part of the year, and the name of the Sierra Nevada ("Snowy Mountains," *c.* 37° N.) in the south of Spain tells its own story. Any winds coming off the snows are naturally very cold,

even when not intensified locally by peculiarities of relief as in the case of the Bora and Mistral, which are particularly strong cold winds blowing from the north at the head of the Adriatic and down the Rhône Valley respectively. Even in summer the coast-lands usually enjoy cool sea breezes by day, while the strong northerly winds of the eastern Mediterranean are so dry that they feel cool. Moreover, a large percentage of the population lives at considerable altitudes, for the coastal plains are frequently swampy and malarial and tend to be avoided except by a few big cities. The facts that isotherm maps usually show temperatures reduced to sea-level, and that most of the statistics available refer to towns at low altitudes, have probably helped to give many northern people an erroneous idea of the real temperature conditions of the Mediterranean lands.

Although the Mediterranean winters have certain similarities to those of southern England and western France, in that January temperatures are much the same in the northern part of the Mediterranean as in Cornwall and Brittany, and the frequency of cyclones brings rain and constant changes of weather, yet there are considerable differences. There is a smaller number of rain-days, and though the rainfall is usually more torrential, the concentration results in clearer skies and more sunshine than in the rest of Europe. Also, owing to the lower latitude the winter days are longer, the sun higher in the heavens and therefore more powerful. Hence the attraction to tourists of the Mediterranean winter climate, though the winter rainfall may actually be greater in the Mediterranean, *e.g.* sunny Naples has 22 inches in the winter six months compared with 19 inches in Scilly. As late as Easter, however, it is rarely comfortable to sit in the shade on the Riviera coast, and Florence and Rome may be equally chilly, although it is usually hot in the sun, especially if shelter can be obtained from the wind.

The Region of Oceanic Type of Climate.—The oceanic type of climate is familiar to most English readers and need not be described in detail. It may be noted, however, that the prevailing westerly winds of north-west Europe are due to the fact that the majority of the cyclones crossing this area have their centres along the track which passes to the north of Scotland and Norway, and that winds on the southern side of a cyclone are westerly. These westerly winds come off an exceptionally

warm ocean, whose warmth is caused partly by the west winds themselves, since they bring the warm water from the Gulf Stream over to the shores of north-west Europe in the form of warm layers of surface water. The influence of these winds is felt far inland, especially in winter when the land is cold compared with the sea. Their influence is felt, indeed, far beyond the limit of the region delimited on the map as oceanic, though in the north the Scandinavian mountains act as a barrier and cause a somewhat abrupt change between the stormy, changeable climate of western Norway and the more stable, more extreme climate east of the chain. The exceptionally high winter temperature, for the latitude, prevailing over the British Isles, over Norway and over the adjacent seas, is well known as the "winter gulf of warmth," the general north-south trend of the winter isotherms of north-west Europe being particularly noteworthy.

The Continental Climatic Province.—The area with a continental climatic régime embraces practically the whole of European Russia, with the exception of the southern shores of the Crimea, which have a Mediterranean régime. The average pressure in January is higher than elsewhere in Europe, indicating that cyclones are either fewer or less intense. Actually both surmises are true, though enough depressions penetrate the region to give frequent, though slight, precipitation. The greater part of Russia lies on the southern side of the Icelandic-Norwegian cyclone track, so that winds are mainly westerly, but Russia is sufficiently remote from the warm Atlantic for the winds to have lost much of their warming influence so that winter temperatures are much lower than farther west, and precipitation is mainly in the form of snow. Depressions also travel up the Baltic and North German plain. Southern Russia, on the other hand, comes mainly under the influence of the Mediterranean-Black Sea cyclone track, on whose northern side it lies, so that winds are mainly easterly and north-easterly, and as they come from the cold land-mass even southern Russia has winter temperatures below freezing, though the winter season is notably shorter in the south, the average duration of the snow cover ranging from three weeks on the Black Sea coast, to nine months on the shores of the Arctic Ocean. Only under the shelter of the Yaila Mountains in the Crimea, and at the northern foot of the Caucasus Mountains in the latitudes of the northern Mediterranean,

does the January temperature reach an average above freezing-point, while at Archangel the January temperature averages only 7.7° F

Contrary to general belief, Russia is cloudier in winter, which is the season of least precipitation, than in summer. This cloudiness is due to the greater frequency of cyclones, but the small actual amount of water-vapour in the cold air means that precipitation is slight, though as it comes in the form of snow it is very much in evidence. The rigours of the Russian winter have, however, often been exaggerated. Historical causes have kept the Russians backward and the people have acquired neither the mechanical devices nor the material organisation to cope with their winter climate. It should be remembered that Kiev and Moscow have a mean January temperature very similar to those of Toronto and Ottawa respectively and very much higher than that of Winnipeg, and as an American writer says : " There is no horror in a winter blizzard moving at thirty miles an hour at a temperature of thirty below zero, if you see it from the windows of a Winnipeg club."

In summer, Russia lies on the outskirts of an area of relatively low pressure which covers the greater part of Asia. There is a gradual diminution of pressure from west to east, but the isobars are wide apart and there is no marked gradient, with the result that conditions are favourable to the development of thunderstorms, which bring most of the summer rain.

Summer (July) temperatures vary from about 75° F. in southern Russia to about 65° F. over the greater part of central Russia, and even Archangel has a July temperature of 60° . The range between winter and summer temperatures is everywhere great. Summer is the season of heaviest rainfall in Russia, but in the absence of mountains total falls are not great, being under 10 inches for the year in south-eastern Russia, about 20 inches over the greater part of central Russia, but decreasing again to about 10 inches in the Arctic regions

It may be noted that the southern part of Russia has insufficient rain and the northern part insufficient heat for tree growth, so that the region with a continental régime has three great vegetation types, tundra, forest, and steppe. It may be strongly contrasted, therefore, with the region of Mediterranean climate, which has a very similar vegetation over the whole area, apart from

differences of altitude. From a geographical point of view this great difference in natural environment in Russia, caused by differences in the amount of insolation and rainfall from north to south, is of more importance than the similarity of the climatic régime.

The Transitional Climate of Central Europe.—Central Europe may be looked upon climatically as a battle ground where oceanic and continental influences struggle for the mastery. In contrast to the open winters of western Europe, winters here are usually sufficiently cold to cause work on the land to cease. Summers are warmer and winters colder on an average than at similar latitudes in western Europe, so that the range of temperature approaches continental standards. Rainfall is rather more concentrated into the summer months and less spread out through the year than in the oceanic margins. As in the whole of the cyclone belt, however, weather is very variable, and though the changes are not usually so rapid as farther west, yet as in Russia their intensity is greater owing to the central position between two areas, whose climate, and particularly temperatures, often differ markedly, especially in winter. The combat between "Russian" and "oceanic" winters is particularly obvious on the Germano-Polish plain. For instance, Osterode in north-east Germany had 123 days with snow-cover in 1908, but only 23 days in 1903; Magdeburg had 78 days snow-cover in 1917 and only 13 in 1911; Cologne had 54 days snow-cover in 1917 and only 4 days in 1910 and 1914.

As in eastern Europe, the great extension in latitude of the area gives rise to marked differences of actual climate. It is obvious that the climate of the plain of Lombardy with its mulberry trees and rice-fields is different from that of, say, Lulea at the head of the Gulf of Bothnia, where it is impossible to grow fruit trees and very difficult to grow cereals. Moreover, the climate of the Alps is not the same as that of the Scandinavian Highlands, the more southerly latitude of the former giving a much longer winter day, much warmer winter sunshine, and a shorter cold season, the difference being neatly shown by the fact that the Alps are Europe's main winter-sports' ground at Christmas and the Scandinavian Highlands at Easter.

REFERENCES

Climate, by C. E. P. Brooks (London, 1929) contains a very considerable bibliography.

The Climates of the Continents, by W. G. Kendrew (Oxford, 1922)

Handbuch der Klimatologie, by J. von Hann (Stuttgart, 3 vols., 1908, 1910, 1911)

Die Klimate der Erde, by W. Köppen (Berlin and Leipzig, 1923).

MEDITERRANEAN REGION

No	Station	Lat N	Long	Height in feet	Days of	
					Rain.	Snow
1	Gibraltar	36° 6'	5° 21' W	53	84	—
2	Madrid	40° 24'	3° 41' W	2,149	95	4
3	Barcelona	41° 23'	2° 8' E	136	70	3
4	Marseilles	43° 18'	5° 23' E	246	101	2
5	Rome	41° 54'	12° 29' E	207	102	2
6	Naples	40° 52'	14° 15' E	489	112	1
7	Malta	35° 54'	14° 31' E	183	77	—
8	Athens	37° 58'	23° 43' E	351	99	6

MEAN TEMPERATURE—DEGREES F

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	55.0	55.9	57.4	60.6	64.7	69.5	73.4	74.9	72.0	65.7	60.5	56.1	63.7
2	40.3	43.7	47.7	53.8	61.0	69.6	77.2	76.6	67.3	56.1	47.3	41.0	56.8
3	46.9	48.7	51.3	55.9	62.0	68.8	74.2	74.7	69.5	62.3	53.9	48.5	59.7
4	44.3	46.3	49.9	54.9	61.2	67.5	71.8	70.6	66.4	58.6	51.2	45.7	57.4
5	44.6	46.8	50.9	56.7	64.4	70.9	76.1	73.6	69.6	61.7	52.7	46.4	59.7
6	46.6	48.4	51.3	56.5	63.9	70.2	73.2	73.2	70.5	63.1	54.7	49.1	60.1
7	53.5	53.5	55.2	58.6	64.1	70.8	76.5	77.3	74.2	69.1	62.0	56.1	64.2
8	48.4	49.4	52.1	58.6	66.2	74.2	79.9	79.6	73.4	66.0	57.3	52.1	63.2

AVERAGE RAINFALL—INCHES

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	5.1	4.2	4.8	2.7	1.7	0.5	0.0	0.1	1.4	3.3	6.4	5.5	35.7
2	1.3	1.3	1.6	1.6	1.7	1.3	0.4	0.5	1.5	1.8	2.0	1.6	16.6
3	1.4	1.5	1.8	1.9	1.7	1.5	1.0	1.3	2.0	3.1	1.8	1.4	21.4
4	1.7	1.4	1.9	2.2	1.7	1.1	0.7	0.8	2.4	3.8	2.8	2.1	22.6
5	3.2	2.7	2.9	2.6	2.2	1.6	0.7	1.0	2.5	5.0	4.4	3.9	32.7
6	3.7	2.9	2.8	2.5	2.0	1.4	0.6	1.1	2.9	4.6	4.5	4.4	33.4
7	3.2	2.2	1.5	0.9	0.4	0.1	0.0	0.1	1.3	2.9	3.6	3.7	19.9
8	2.0	1.7	1.2	0.9	0.8	0.7	0.3	0.5	0.6	1.6	2.6	2.6	15.5

WESTERN EUROPE

No	Station	Lat N	Long	Height in feet	Days of	
					Rain	Snow
1	Corunna	43° 23'	8° 23' W	82	125	0
2	Bordeaux	44° 50'	0° 36' W	157	160	0
3	Paris .	48° 18'	2° 7' E	164	162	14
4	Scilly .	49° 56'	6° 18' W	131	207	3
5	London (Kew)	58° 28'	0° 19' W	18	167	13
6	Bergen	60° 23'	5° 21' E	72	206	38
7	Oslo	59° 55'	10° 43' E	82	145	51

MEAN TEMPERATURE—DEGREES F

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	48.5	49.5	50.7	53.3	57.4	61.5	64.1	64.6	62.7	58.0	53.2	50.7	56.2
2	42.6	45.5	47.6	52.1	57.4	64.1	67.8	67.5	63.9	56.7	47.9	42.4	54.6
3	36.7	39.4	43.3	49.2	56.2	61.6	64.7	63.8	58.4	50.0	42.5	38.1	50.3
4	45.7	45.3	46.0	48.6	52.5	57.2	60.5	60.8	58.6	53.8	49.8	47.4	52.2
5	38.9	40.1	42.4	47.3	53.4	59.2	62.7	61.6	57.1	49.9	44.0	40.3	49.7
6	34.2	34.3	36.0	42.3	48.9	55.2	57.9	56.7	52.0	45.3	39.2	35.6	44.8
7	23.9	25.2	30.7	40.3	51.1	59.7	63.0	60.1	52.5	42.6	32.7	26.4	42.4

AVERAGE RAINFALL—INCHES

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	3.2	3.1	3.2	2.5	2.2	1.4	0.9	1.2	2.2	3.5	4.2	4.4	32.0
2	2.8	4.1	3.3	2.9	2.6	2.6	2.2	2.1	1.5	3.2	5.0	3.1	35.4
3	1.5	1.4	1.6	1.7	1.9	2.1	2.2	2.1	1.9	2.3	1.9	2.0	22.6
4	3.0	2.6	2.4	1.9	1.7	1.7	2.2	2.6	2.4	3.7	3.3	4.4	31.9
5	1.8	1.5	1.7	1.5	1.7	2.1	2.2	2.2	1.9	2.7	2.2	2.3	23.8
6	9.0	6.6	6.2	4.3	4.7	4.1	5.7	7.8	9.2	9.3	8.5	8.9	84.3
7	1.6	1.3	1.5	1.5	1.8	2.0	3.0	3.6	2.4	2.6	2.0	2.0	25.3

CENTRAL EUROPE

No	Station	Lat N	Long	Height in feet	Days of	
					Rain	Snow
1	Haparanda	65° 50'	24° 9' E	30	145	77
2	Stockholm	59° 21'	18° 3' E	146	168	58
3	Berlin	52° 45'	13° 24' E	196	152	34
4	Warsaw .	52° 13'	21° 1' E	436	160	57
5	Vienna .	48° 15'	16° 22' E	664	153	32
6	Bucharest	44° 25'	26° 6' E	269	106	23
7	Venice .	45° 26'	12° 20' E	82	97	—

MEAN TEMPERATURE—DEGREES °F

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	11.7	10.4	16.7	28.6	39.2	53.1	59.0	54.7	45.7	34.3	23.0	14.0	32.5
2	26.8	26.4	29.7	38.1	47.7	57.4	61.9	59.4	52.5	43.3	34.9	28.8	42.2
3	30.0	33.1	37.9	47.5	56.8	63.1	66.0	64.8	58.3	48.0	38.7	33.1	48.2
4	26.4	28.6	35.2	46.2	57.2	63.0	65.7	63.5	56.1	46.4	36.0	29.8	40.2
5	29.1	32.9	39.7	49.8	59.0	64.9	68.2	66.9	59.9	50.0	39.2	32.4	49.3
6	26.2	30.6	41.0	52.2	62.2	68.9	72.9	72.0	63.5	52.9	39.7	30.9	51.1
7	37.0	40.5	46.7	54.8	63.5	70.6	75.5	74.0	67.4	57.8	46.8	39.8	56.2

AVERAGE RAINFALL—INCHES

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	1.5	1.1	1.0	1.0	1.2	1.5	1.8	2.1	2.4	2.2	2.0	1.4	19.2
2	1.4	1.2	1.4	1.4	1.5	1.7	2.6	3.0	1.9	1.8	1.8	1.9	21.6
3	1.7	1.4	1.6	1.5	1.9	2.3	3.0	2.3	1.7	1.7	1.7	1.9	22.7
4	1.2	1.1	1.3	1.5	1.9	2.6	3.0	2.9	1.9	1.6	1.5	1.5	22.1
5	1.5	1.3	1.8	2.0	2.8	2.7	3.1	2.7	2.0	1.9	1.8	1.8	25.4
6	1.3	1.1	1.6	1.7	2.5	3.5	2.7	2.0	1.6	1.7	1.9	1.6	23.1
7	1.6	1.6	2.0	2.4	2.9	3.0	2.3	2.5	2.8	3.6	2.7	1.9	29.3

EASTERN EUROPE

No	Station	Lat N	Long	Height in feet	Days of	
					Rain	Snow
1	Archangel	64° 35'	40° 36' E	22	174	99
2	Leninograd	59° 56'	30° 16' E	16	173	72
3	Moscow	55° 46'	37° 40' E	512	169	82
4	Kasan	55° 47'	49° 8' E	266	121	54
5	Kiev	50° 27'	30° 30' E	600	153	56
6	Astrakhan	46° 21'	48° 2' E	-45	56	31
7	Odessa	46° 29'	30° 44' E	214	88	21

MEAN TEMPERATURE—DEGREES °F

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	7.7	9.1	18.0	29.8	41.0	53.4	60.3	56.3	46.4	34.2	21.7	11.7	32.5
2	18.0	17.6	24.4	36.3	48.4	58.5	63.3	60.1	51.1	40.5	30.2	21.6	39.2
3	13.3	14.2	23.2	37.9	53.8	61.3	66.0	61.9	51.6	40.5	27.7	19.2	39.0
4	7.5	11.3	20.8	38.3	55.4	63.3	67.8	63.3	51.8	38.1	24.3	13.5	37.9
5	21.2	23.5	31.1	44.4	58.5	63.3	66.7	64.8	56.1	45.1	33.3	25.7	44.4
6	19.2	22.8	32.7	47.8	63.5	72.5	76.1	73.8	62.6	49.5	36.0	26.6	48.6
7	27.3	28.9	36.7	47.4	60.1	67.6	72.6	71.1	62.2	52.3	39.9	32.0	49.8

AVERAGE RAINFALL—INCHES

No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1	0.9	0.7	0.8	0.7	1.2	1.8	2.4	2.4	2.2	1.6	1.2	0.9	16.8
2	10.0	9.9	9.9	10.0	16.0	20.0	25.0	28.0	21.0	18.0	14.0	12.0	19.3
3	13.1	12.1	14.1	14.1	18.1	26.1	32.1	31.1	22.1	21.1	17.1	16.1	23.6
4	9.0	7.0	8.0	9.0	14.0	24.0	22.0	21.0	17.0	15.0	13.0	10.0	16.9
5	14.1	12.1	17.1	17.1	20.1	29.1	32.1	22.1	18.1	19.1	16.1	16.1	23.2
6	0.5	0.4	0.4	0.7	0.7	0.8	0.5	0.5	0.5	0.5	0.5	0.6	6.6
7	1.0	0.8	1.1	1.0	1.2	2.2	1.9	1.3	1.3	1.2	1.3	1.2	15.5

CHAPTER III

VEGETATION

THE natural vegetation of Europe has been so much interfered with by man that few traces remain of the unmodified covering except in the higher and more unfavourable latitudes and altitudes. Since, however, both the natural and cultural vegetation are influenced by the same climatic and soil conditions, the two may be considered together.

Five main belts of natural vegetation may be distinguished (*see* Fig. 11): the tundra, the coniferous forest, the mixed forest in which deciduous trees predominated, the Mediterranean, and the grasslands. In addition a small belt of semi-desert occurs in the south-east and patches of Alpine flora are found on the higher mountains throughout the continent.

The Tundra Zone.—This cold, treeless belt lies mainly within the Arctic Circle in a narrow zone bordering the Arctic Sea. The ground is frozen for the greater part of the year and the subsoil always frozen. The frost period lasts for nearly three-quarters of the year and the average July temperature seldom exceeds 52° F. The vegetation, although entirely low-growing, shows considerable variety, and in addition to the well-known reindeer-moss and lichens includes peat-bogs, stunted bushes of shrubby habit, and in favourable, well-drained positions summer-meadows. Agriculturally, however, the region is useless and there are no cultivated crops, though it affords pasture for small numbers of reindeer.

The Coniferous Forest Zone.—This belt extends southwards from the Tundra zone to about 62° N. in Norway, Sweden, and Finland, but dips still farther southwards to about 53° N. in eastern Russia. The highlands of Scandinavia interpose a long tongue of tundra-like vegetation into this belt. Owing to the short growing season, the relatively low summer temperatures, and the acid soils of this region, agriculture is very difficult, only a few clearings have been made, and the forest remains the chief European reserve of timber. Spruce (*Picea excelsa*)

and Scots pine (*Pinus sylvestris*) predominate, with Siberian species, e.g. larch (*Larix sibirica*), Siberian spruce (*Picea sibirica*) and fir (*Abies sibirica*) being also found in Russia. One deciduous tree is widely found in this belt, namely, the silver birch (*Betula alba*), whilst alders (*Alnus glutinosa*) and rowans (*Pyrus aucuparia*) occur to some extent. In general only the hardier cereals and roots, such as barley, oats, and potatoes, can be cultivated, and these with difficulty. Fruit trees are generally absent, but berry-bearing bushes are numerous. Hay grows well

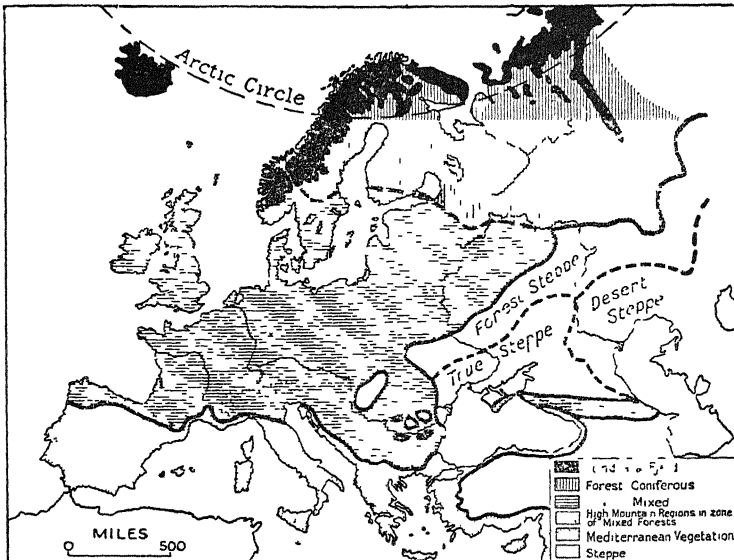


FIG. II.—VEGETATION ZONES OF EUROPE.

in the long days of the northern summer, but is difficult to dry.

The Zone of Mixed Forest.—This once covered the greater part of Europe with the exceptions of the two regions mentioned above, and the belts of grassland and Mediterranean vegetation. Broad-leaved, deciduous trees predominated, but conifers were found to some extent on the poorer, especially the sandier, soils and in the mountainous districts. In Great Britain, however, there were only two native coniferous trees, the Scots pine and the yew (*Taxus baccata*), of which only the former formed forests of any extent. Unlike the coniferous forest,

the mixed-forest belt has been mainly cleared for agriculture, and generally only the poorer soils or steep mountain slopes are now forest-covered, having often been planted with exotic conifers, with the result that the proportion of conifers has greatly increased.

Owing to the wide extension in latitude, from about 42° N. to 62° N., and the change from the oceanic climate of the west to the continental climate of the east, this zone gives opportunity for a great variety of cultivated

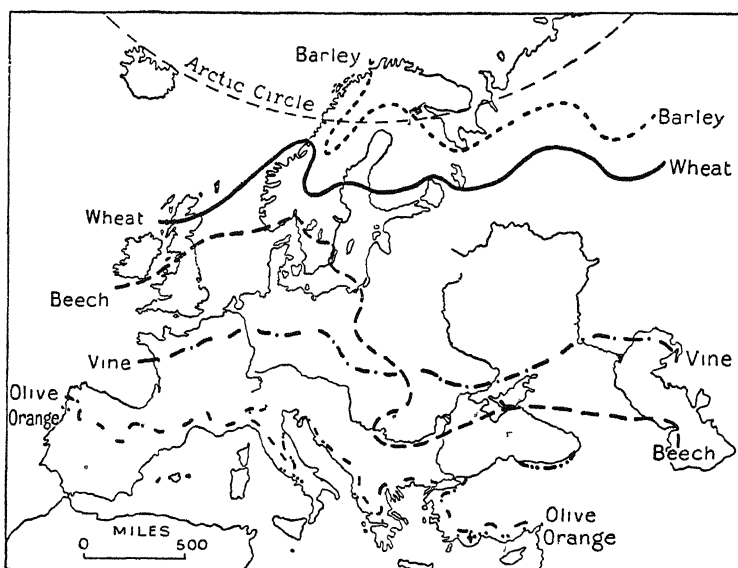


FIG 12 —NORTHERN LIMITS OF CERTAIN PLANTS AND TREES IN EUROPE

Note, however, isolated regions of olive culture in northern Italy and on the southern shore of the Black Sea

crops. The chief cereal is wheat in the central and southern parts of the belt, with barley and oats also very generally grown. Rye tends to be the most important bread cereal in the northern part of the belt, especially round the Baltic and in Russia. Maize is of some importance along the southern margin. Root crops are generally grown, including sugar-beet and potatoes. Cultivated grasses, including clover, are very important, and in the wetter north-west meadows cover a large area, much of which may at one time have been occupied by other types of vegetation. A large number of fruit trees are grown,

such as the apple, pear, plum, etc., and small fruits also flourish. The vine is widely grown south of about 50° N. The milder south-western portion of the belt shows a particularly large variety of crops.

Intruding into this zone there are outlying patches of the grassland belt in the plains of Hungary, Romania, and Bulgaria, while the higher parts of the Alps, Pyrenees, and Carpathians rise above the forests into the zone of Alpine flora.

The Mediterranean Zone.—The natural vegetation of the Mediterranean lands consists of plants which can either withstand or evade the summer drought. The characteristic Mediterranean trees, for instance, have small leaves, low stature, and other devices for checking loss of moisture, but each tree needs a considerable area of root space to supply it with sufficient water in the dry season, and the characteristic Mediterranean "forest" grows in open formation and is hardly worthy of the name. It easily degenerates into scrub, known under various names, such as *maquis* in Corsica, *macchia* in Italy, and *garrigue* in southern France. Only a few kinds of trees have been successful in surviving this rather unfavourable climatic régime. Such are the olive, holm oak (*Quercus ilex*), cork oak (*Q. suber*), and various conifers, such as *Pinus maritima*, *Pinus halepensis*, and the stone pine (*Pinus pinea*). The evergreen character prevents loss of time in resuming growth. On the mountains having considerable rain, and where the summer drought is less marked, deciduous trees occur, especially the sweet chestnut (*Castanea sativa*), and on the higher slopes various conifers, but the latter have been largely cleared. Once the vegetation cover was removed from the mountains, the torrential rain swept away the soil cover, which is not easily renewed in this climate. Hence the predominance of bare rock in mountainous districts.

Various heaths and aromatic herbs such as lavender, myrtle, rosemary, thyme also manage to survive the drought, and these shrubs, like the trees, also have devices to prevent loss of moisture. Grass, however, withers in early summer and seldom grows in close formation except in the swampy deltas and coastlands. The cultivated grasses, of which barley and wheat may be native, similarly evade the drought by ripening in May, June, or early July, according to latitude and altitude. Bulbs evade it by lying dormant in summer and flowering in winter and spring.

Owing to the scarcity of grass the rearing of cattle is unimportant, but the aromatic herbage provides food for sheep and goats, though it has little fattening value and often gives the flesh a peculiar taste. Transhumance is widely practised, the animals being moved to the mountain pastures in summer and to the lowland grazing grounds in winter, since the mountains are usually under snow in winter and the lowland herbage burnt up in summer. The sheep and goats, in nibbling the leaves of young trees, are among the many enemies to the re-establishment of the Mediterranean woodlands. Owing to the absence of cattle there is a general absence of dairy produce, although sheep's and goat's milk is used to some extent.

The cultivated Mediterranean fruits are generally not natives of the basin, nor, as a rule, are they perfectly suited to the climate. The orange is apparently a native of the summer rain lands of southern China and is therefore not naturally adapted to summer drought, and usually it needs irrigation here. The closely allied lemon is confined to the southern margins of Europe, being even more sensitive to cold than the orange, and also generally needing irrigation. Even the vine is often irrigated in the Mediterranean zone, and except in regions of rather heavy rainfall is usually grown in hollows where it can take advantage of all the moisture available; it is, of course, widely grown outside the region of Mediterranean climate. Peaches and apricots are also not indigenous, in fact, the only two indubitably native fruits appear to be the olive and the pomegranate. The olive forms a useful guide to the limits of the Mediterranean climate on the north, but the mountains inside the region are also too cold for its cultivation. The three traditional food-staples, however, are bread, wine, and olive oil.

The Grassland or Steppe Zone.—This belt stretches in a south-west to north-east direction and lies mainly in Russia. It has probably been extended northwards at the expense of the forest, and near its northern border it often retains patches of forest along the rivers. Trees were unable to flourish in a climatic régime which combined frozen winters and arid summers, and possibly also the fine, airless, loss¹ soil was an unfavourable factor.

The natural vegetation consisted mainly of grasses, among which grew many bulbs and flowering plants which died down under the heat of summer. Under cultivation

¹ For the origin of loss, see p. 222

the meadow steppe produces excellent cultivated grasses, particularly wheat, barley, oats and rye, with some maize in regions of warmer and wetter summers. Crops other than annuals are difficult to grow. For instance, although the summers are long and warm enough for the vine in the south-western part of the zone, the stumps (*ceps*) have to be protected in winter under mounds of earth.

Round the Caspian Sea the meadow steppe passes into poor steppe, generally with salt-loving plants, and the rainfall (generally under 10 inches per annum) is insufficient for cultivated crops.

REFERENCES

A. F. W. Schimper's great volume on *Plant Geography*, translated by W. R. Fisher (Oxford, 1903), has relatively little on Europe, and the most useful work is M. E. Hardy's *The Geography of Plants* (Oxford, 1925). Also, Marion I. Newbigin's *Plant and Animal Geography* (London 1936) contains much useful material.

Two articles on the "Agricultural Regions of Europe," by O. Jonassen, in *Economic Geography*, Oct. 1925, and Jan. 1926, may be profitably consulted.

CHAPTER IV

RACE NATIONALITY, AND LANGUAGE

THE territorial division of Europe among some twenty-eight independent countries, each with its own separate political, military, economic, and social organisations, forms one of the essential aspects of the geography of the continent, especially in its effect on the various branches of human, including economic, geography. Each of these countries, with but few exceptions, is divided from all the others by differences of language, a fact which renders difficult the exchange of ideas, hinders the spread of knowledge, and limits the growth of understanding between the various peoples. Moreover, each country emphasises its separate entity by import duties on goods, and by restrictions on the entry of persons from other countries. The number and extent of the different countries of Europe has varied very much from time to time (the study of these changes being one of the chief pre-occupations of European history), but generally speaking, the tendency until the end of the nineteenth century was for smaller countries to be amalgamated to form larger ones, for dialects to lose their more outlandish forms and to merge together into standard languages, and for internal hindrances to the free movement of goods and peoples to be abolished. During the nineteenth and twentieth centuries, nevertheless, and in some cases earlier, a reaction set in, principally because some groups of people, who had been included in large states, had not been assimilated into the main body, and on one ground or another were discontented with their lot. This separatist movement found its main opportunity during the political upheavals which accompanied and followed the Great War, and which resulted in the break-up of the Austro-Hungarian empire and territorial losses to the Russian and German empires. The movement had, however, been active in south-eastern Europe for some time, and had already resulted in the partial break-up of the Turkish Empire during the nineteenth and twentieth centuries. It had also been manifest in other countries,

e.g. Ireland, Catalonia, and Flanders. In nearly all cases, the people who broke away, or wished to break away, spoke a different language from the official one of the state, but the claim to independence was sometimes based on differences of so-called race, and more often on differences of nationality, a convenient but vague term, very difficult to define.

At the present day practically the whole of Europe is organised politically on a national basis, in contrast to the imperial organisation which prevails over most of Africa and Asia. The Americas, with their colonists of European descent, are also organised on the same basis, at least as far as their white inhabitants are concerned, and the idea seems to be spreading also to those parts of the world where it was hitherto unknown, *e.g.* Egypt and India. Since the concept of nationality has had and is still having so much influence on territorial distributions, a brief examination of the idea is necessary.

A word or two may first be said in regard to the prevailing popular confusion between the two terms "race" and "nationality." The study of race is concerned simply with physical characteristics, and according to anthropologists there are three main racial groupings in Europe: (a) the Mediterranean, mainly in the region of the same name; (b) the Nordic, mainly in northern Europe; and (c) the Alpine, in the region between. The shape of the skull is taken as one of the main criteria of race, a man whose head is long in proportion to its width being termed dolicocephalic, while one whose head is nearly as broad as long is called brachycephalic. Coloration also is important, since both the Mediterranean and Nordic people are long-headed, but differ from each other in colouring, the former being generally dark-eyed and dark-haired with sallow or brownish skins, and the latter blue or grey-eyed and fair-haired with fair skins and pink cheeks. The latter type, it may be added, is unique, being indigenous in northern Europe and nowhere else in the world. The Alpine type is broad-headed, and generally intermediate in colouring between the Mediterranean and Nordic. In all three races there is a good deal of variation in stature, but on the whole, the Mediterranean people are inclined to be short and slight, the Nordic taller and larger-boned, while the Alpine type varies, *e.g.* from the short Auvergne type to the tall Dinaric type, but is generally more thickset than either the Nordic

or the Mediterranean. The ancestors of the present-day peoples belonging to these three races are thought to have entered Europe at the close of the Ice Age. There must have been considerable intermingling between members of these three groups, and apparently also between the latter and small groups of people whom they found already in Europe. In addition to the three main racial groups, there are also small bodies of people, such as the Turks, Bulgars, Magyars, Tartars, who entered from Asia in historic times and who intermingled to some extent with the European inhabitants of the regions which they conquered. None of the races nor indeed any human race, can be considered as biologically "pure," since races, like mountain chains, are in process of disruption even during the process of formation. All belong to the species *Homo sapiens*, the only surviving species of *Homo*.

Strange as it may seem, this racial grouping has remarkably little relation to language grouping and still less to nationality. There are three main groups of languages in Europe: Romance, Teutonic, and Slavonic, all of which are derived from an Indo-Germanic or Aryan stem. In addition, there are a number of minor languages of different origin. Not one of the three main groups is confined to any particular race. On the contrary, there are people of each race speaking languages derived from each of the three main groups. For instance, the French language, which is of Romance, *i.e.* Latin origin, is spoken by people of Nordic type in the north of France, by people of Mediterranean type in the south, and by people of Alpine type in the centre. Similarly, the English language, of Teutonic origin, is spoken by people of Mediterranean type in Cornwall and by people of Nordic type in East Anglia, and though people of Alpine type are few in England, yet they are plentiful in southern Germany where another Teutonic language is spoken. Perhaps the most widespread confusion has arisen in the case of the Slavonic and Celtic languages, these terms having been frequently used as racial labels. Nothing could be further from the truth, as an examination of the racial types, *e.g.* in Poland and Ireland, has shown. Poland, whose inhabitants all speak a Slavonic language, is a land of very varied physical type, and anthropologists recognise Nordic stock in the tall, fair people of the north, in contrast to the shorter and darker people of the south, who are of Alpine or in some cases possibly of Mediter-

racean origin. Traces of earlier peoples and also of Mongoloid types are also noted in Poland. In Ireland, even leaving on one side the seventeenth-century settlers in Ulster, there is still a great variety of types, including a considerable element with Mediterranean characteristics, a number of other dark dolicocephals representing a still earlier migration, a sprinkling of Nordics descended from Norse invaders, and a small number of broad-heads. The *q*-Celtic language, known as Erse, spoken to some extent in Ireland, was probably brought to the country about 1000 B.C. by a people representing an early cross between Nordic and Alpine types. These "Celts" probably ruled as a military aristocracy, and seem to have had comparatively little influence on the racial composition of the Irish. It is just as absurd, in fact, to speak of a Celtic or Slavonic race as it is to speak of a dolicocephalic or brachycephalic dictionary, and similarly, there is no Aryan race, only an Aryan group of languages. On the other hand, the belief held by any group of people that they are of a homogeneous race has often greatly fostered their sense of cohesion, or in other words, their national spirit.

The connotations of nationality are so complex and variable that all attempted definitions are bound to be vague. A national spirit, however, may be said to be a feeling of coherent solidarity prevailing in a group which for generations has experienced a similar mode of life, and has thus acquired a common tradition. This feeling of group consciousness is not of course new, it is perhaps merely a tribal spirit on a larger scale, but a nation differs from a tribe in the size and complexity of the group, most of whose members can never come into contact with each other or with their ruler. National consciousness seems to have come to the fore in England and France about the time of the Hundred Years' War when English was becoming the accepted language of the ruling classes in England in place of French. Before that time the old Roman idea of the unity of the civilised world had held sway and the dream of reviving the old Roman Empire in the new guise of the Holy Roman Empire was still cherished for many centuries, especially by the Church, who wished to see a peaceful Europe in which all men should be citizens of Christendom: a noble ideal, but one doomed to failure in the presence of many competing, semi-barbaric groups and the absence of any adequate system of communication. The germ of the national spirit may be traced in

many countries in the late Middle Ages—for instance, in Dante's aspirations for a united Italy—but the sword was all-powerful and the imperial or dynastic idea usually prevailed. It was only in the nineteenth century that a really new twist was given to the idea of nationality, and this came with the rise of the notion that those who wanted to join together in a national group had a definite right to do so, a democratic idea to be connected with the spread of the French revolutionary doctrine that men had rights as well as duties. At the end of the Napoleonic Wars in 1815, only six of the present-day states of Europe, the United Kingdom, France, Spain, Portugal, Denmark, and Switzerland, had approximately their present limits, the remaining twenty-two of the twenty-six existing to-day being either very different in size and shape, or non-existent. Belgium and Holland in 1839 were the first of the new states to achieve their present outlines, Italy became united in 1861, the German Empire in 1871, Greece, Serbia, and Romania achieved their independence from the Turks during the nineteenth century, Sweden and Norway separated in 1905, and the remaining changes have mainly taken place since 1918.

It should be noticed that in nearly every case each state now possesses a language of its own, not spoken in Europe by any other group, and though there are many dialects of each language, yet the inhabitants of each state are usually mutually intelligible. This tendency towards "one state, one language" is a growing one, even where for centuries the educated classes have spoken one of the more widespread languages of Europe; for instance, the written language of Norway was for centuries the same as Danish, and the educated people of Finland all spoke Swedish, but in each case a peasant speech is being standardised and is acquiring the dignity of a written language. The same revival of languages or dialects which seemed in a moribund condition has been happening all over Europe, owing to the fact that language has assumed importance as the main symbol of nationality. In one or two cases, however, a state does not possess an individual and exclusive language, for instance, part of Belgium is French-speaking, while in Switzerland four languages—German, French, Italian, and Romansh—are spoken in different parts and all have equal status. These countries must be looked upon as quite untypical exceptions. For instance, Belgium would probably now

be part of France had it not been for the traditional policy of England against a strong power holding the Low Countries, and even Switzerland has found forces of disruption in her differences of language, though in regard to the commercial position of the country as a transit land they are very useful. The common German speech of Austria and the German Reich facilitated their union.

Whether the growth of nationalism was a good or bad thing for Europe need not be discussed here. The existence of these nation states is a *fait accompli* which history presents to geography as one of the distributional facts of Europe. Possibly, however, in the first place the origin of the various nations may be considered a geographical study, at least in part, for the nations are indubitably associated with certain pieces of territory. With few exceptions, each nation took its origin in an area of fertility capable of supporting large numbers of people in easy communication with each other, and each fertile area was separated from other such areas by belts of mountainous or otherwise barren country incapable of supporting more than a scanty, disunited population. Thus the nucleus of the English nation was in the south-eastern lowlands, that of France in the large and fertile Paris basin, that of the Netherlands in the fertile dyked lands of Holland, and so on. This aspect of nationality is as complex as any other, and in some instances modern nationalities have emerged on the basis of a tradition nearly two thousand years old, as, for instance, in the cases of Italy, Greece, and Romania.

It is, however, the concern of the geographer to note the facts of the distribution of the various states, but these can be seen at a glance from the map and need not be detailed here. The effects of this extreme subdivision of Europe on its economic organisation, or lack of it, are very complex and are to be seen in all aspects of the human geography of the continent. For instance, the geographer has not only to consider the capabilities of each part of the continent as regards productivity, but the many artificial influences at work in modifying the type of production, by artificial encouragement or restriction, and in altering the natural currents of exchange. The contrast between, *e.g.*, the development of Austria and Switzerland, also illustrates the differences impressed on groups by their national organisation, since these countries are

similar physically but differ profoundly in national outlook and in their economic life

Were Europe to become a single administrative unit, similar to the United States of America, for example, to which it is comparable in size, one could imagine its economic geography showing very considerable divergencies from the present. The United States, however, had the advantage of starting with all the experience of Europe, and especially of the most advanced part of Europe, behind it, with settlers of one dominating speech and tradition. Into this nucleus the later newcomers of varied nationality merged gradually and scattered throughout the length and breadth of the country, seldom forming solid blocks. Moreover, the United States developed at a time when improvements in methods of communication made large administrative units easy to manage. Europe, on the other hand, had to learn from its own experience, starting with the disadvantage of a multitude of small groups with different customs and varied languages, and each attempt towards unity was interrupted by the incursions of fresh invaders, and frustrated and hindered throughout by the difficulties of communication before the era of railways and telegraphs. The frequent presence of mountains, forest, and swamp enhanced the difficulties of communication and helped to isolate groups, so that communities living only twenty-five miles apart could develop almost unknown to each other, and a multiplicity of languages arose and persisted. It is not surprising that Europe has inherited a legacy of separatism and antagonism between its political groups, though this must needs be a hindrance in view of the increasing economic interdependence of the various parts of the continent and of the world.

REFERENCES

The Races of Europe, by W. L. Ripley (London, 1899), is the classic work on the subject. *The Peoples of Europe*, by H. J. Fleure (Oxford, 1922), is a small but useful work. *The New World Problems in Political Geography*, by I. Bowman (New York, 4th ed., 1928), deals mainly with Europe and has excellent maps. *Traité comparatif des nationalités*, Vol. I. *Les éléments extérieurs de la nationalité*, by A. van Gennep (Paris, 1922), and *The Frontiers of Language and Nationality in Europe*, by L. Dominian (New York, 1917), may be usefully consulted, but the latter was written before the present political frontiers were established. On the question of race generally, see also *The Races of Man*, by A. C. Haddon (Cambridge, 1929), and a very helpful article by V. Gordon Childe in *History* (Oct. 1933).

PART II—REGIONAL GEOGRAPHY

SECTION I—SOUTHERN EUROPE

CHAPTER V

GENERAL INTRODUCTION TO SOUTHERN EUROPE

SOUTHERN Europe consists essentially of the lands bordering the northern side of the Mediterranean Sea, with, however, the exception of Asia Minor. From a geographical point of view they form only a part of the great natural region which embraces *all* the lands bordering the Mediterranean Sea (with the exception of Egypt, which comes within the Sahara Desert zone), and the division into Europe, Asia, and Africa in this Mediterranean region is a convention of little geographical significance. These lands, lying between about 31° N. and 46° N., have a remarkable similarity of structure, relief, climate, vegetation, modes of agriculture, and, in spite of differences in language and religion between the European and non-European portions of the region, the general culture, or mode of life, is very similar. The similarity in culture was most marked under the Roman Empire, and in spite of repeated incursions of new peoples has constantly reasserted itself, owing largely to the strong similarity of natural conditions which prevails in all the Mediterranean lands. These natural conditions are markedly individual, and are peculiar to only a very few parts of the globe, *e g* California and the Cape of Good Hope, but nowhere else are they so well represented as in the area under discussion.

The most marked individuality is to be seen in the climate, which combines the rainy winters of the cyclone belt with the arid summers of the Sahara Desert belt. (*See* Chapter II.) The climate is consequently sharply differentiated from that of the other climatic regions of Europe, which are alike in having rain in summer, and it follows that the native Mediterranean vegetation is also markedly different, having special adaptations to

withstand the summer drought (*See* Chapter III) The Mediterranean climate and vegetation are, however, confined to the lands narrowly bordering the sea, and are modified or disappear altogether away from the coastal zone For instance, the interior of the Balkan or South-Eastern peninsula has a Central-European climate with rain all the year and a Central-European vegetation association, so also has the plain of the Po in northern Italy The interior of the Iberian peninsula, on the other hand, has dry summers, but these are combined with cold winters having little rain, so that here there is an approach to desert conditions.

The third characteristic feature of the Mediterranean lands is their mountainous character. The Mediterranean Sea is almost entirely ringed round by young folded mountains, and its islands for the most part consist of isolated fragments of these chains. This gives the agriculture of the region one of its distinctive aspects, since it must be largely practised on hill slopes, little suited to the plough, often needing terracing to prevent loose soil from being washed away by the rain, which though infrequent is often torrential in character. Agriculture under these conditions is more concerned, therefore, with tree products than with cereals, though the interpenetration of plain, valley, and mountain, together with nearness to the sea, gives a great variety to the Mediterranean landscape and to Mediterranean modes of life.

Incidentally, the heavy erosion of this mountainous region helps to give the Mediterranean landscape its characteristically sharp outlines, in contrast to the softer forms of most of the rest of Europe. The clearness of the air accentuates this sharpness, as there is rarely the veil of mist or "depth " of atmosphere to be found in the moister lands of north-western or central Europe. The mountains also provoke an increased rainfall and often supply irrigation water to the little plains.

In consequence of the mountainous nature of the land and the absence of navigable rivers, the sea frontage has always assumed great importance, although the Mediterranean is not very rich in fish. The sea provided a relatively easy highway between regions whose land communications were difficult, and encouraged the early development of maritime life. Its importance was at its height in the days of the Roman Empire, which consisted

essentially of a ring of land surrounding the mid-land sea. Its present-day traffic is, no doubt, larger than in classical times, but the relative importance of the sea is less, owing to the opening up of the rest of the world. The Mediterranean Sea at the present day is primarily a link in the shipping route between western Europe and the Orient, which was opened up by the cutting of the Suez Canal in 1869.

In classical times there was a marked community of culture round the whole basin, but the coming of the Moslem Arabs and Turks, from the seventh century onwards, created differences between the European and Asia-African sides of the basin. With the French and Italian conquests on the southern side in the nineteenth and twentieth centuries, these differences are being diminished, and, in fact, the essential modes of life have always continued very much the same, since the environment offers such a narrow choice of land utilisation.

Early Civilisation.—On the debt which civilisation owes to the Mediterranean region it is not here necessary to enlarge. The spread of civilisation from the south-eastern corner of the Mediterranean to Greece, thence to Italy, and thence to the non-Mediterranean world, is well known. The geographical conditions in which early civilisation grew up in Egypt, the Near East, and the Mediterranean can be described fairly accurately, but it is difficult to say precisely what combination of circumstances caused the extraordinary quickening of spirit which produced the great early civilisations, and though there has been much conjecture, it cannot be maintained that the question is at all fully elucidated. From the geographical point of view it is clear that the environment was such as to stimulate early man without overstraining his powers, since the region was not so warm as to be enervating, nor so cold as to leave no time except for obtaining the bare necessities of life. The forest was in open formation and easier for early man to deal with than the dense, wet forests of north-western, central, and north-eastern Europe, and could be easily, in fact too easily, subdued by man's early weapon of fire. The great variety of environment allowed the provision of all the necessities of life in a small area and also gave valuable experience in dealing with different problems of adaptation. The peculiar flowering of city life in the early Mediterranean is not, however, very easy to explain, although

the large number of naturally defensive sites is, no doubt, part of the explanation

At the present day the Mediterranean region has lost its former prominence in the van of civilisation as well as much of its political and economic importance, though the recent resurgence of Italy may mark the beginning of a revival. The reasons for these changes are partly historical, and it is a truism that centres of world power have tended to move northwards into regions of greater difficulty, but the present lack of economic strength may be ascribed largely to the absence of any large supplies of coal, oil, water-power, and iron ore, and also to the very restricted nature of the fertile plains

In the following chapters the greater part of Italy and the whole of the Iberian peninsula will be dealt with, even though their northern parts lie outside the region of Mediterranean climate and natural vegetation. It is useful to include the whole of these countries in the section on southern Europe, since they have come so markedly under Mediterranean political and social organisation. The South-Eastern peninsula, however, apart from the Greek peninsula and islands, will not be included, as the major portion is definitely non-Mediterranean in almost every aspect.

REFERENCES

Southern Europe, by M. I. Newbigin (London, 1932), is the standard work in English. The same author's *Mediterranean Lands* (London, 1924) deals mainly with the historical geography of the region.

E. C. Semple's *The Geography of the Mediterranean Region* (New York, 1931), embodies the historico-geographical researches of this writer.

A. Philippson's *Das Mittelmeergebiet* (Leipzig, 1904), 4th ed., 1922, is a standard German work. For references on structure, see end of Chapter I. *Peninsular Europe*, by L. W. Lyde (London, 1931), contains interesting chapters on the Mediterranean lands.

An Historical Geography of Europe, by Gordon East (London, 1935), describes the human geography of Europe at successive periods from the time of the Roman Empire onwards, and may be profitably consulted for Western and Central Europe also.

CHAPTER VI

ITALY

THE Italian peninsula may be looked upon as the most Mediterranean in character of all the three southern peninsulas. Mediterranean influences permeate the region more fully than in the South-Eastern peninsula or even the Iberian peninsula, largely owing to its long and narrow shape. In climate, especially, it is more Mediterranean than the other two peninsulas. In the South-Eastern peninsula only on the Dinaric coast does the Mediterranean climate extend as far north as in Italy, and the reason for this northward extension is essentially the same in both cases, *i.e.* the coastal character. Peninsular Italy is so long and narrow and so open to sea winds that it may be looked upon as climatically *all* coastal. It is too narrow to develop a marked pressure system of its own, but comes under the influence of pressure variations over the Tyrrhenian and Adriatic Seas, so that, whereas Niš in the interior of the South-Eastern peninsula has a continental climate, Florence in the same latitude in the interior of peninsular Italy has a Mediterranean one. It may here be noted that the Italian peninsula has a smaller area south of 40° N. than the other two. Brindisi, for instance, lies in the same latitude as Salonika and Madrid ($40\frac{1}{2}^{\circ}$ N.), whereas Genoa ($44\frac{1}{2}^{\circ}$ N.) is in much the same latitude as Bucharest and Belgrade, and lies farther north than any part of Spain, but is still within the region of Mediterranean climate.

Nearly a third of Italy, however, lies north of the Apennines outside the region of Mediterranean climate, both the North Italian Plain and the Italian Alps falling within the climatic region of Central Europe, with cold winters and the absence of a dry season. Northern Italy, however, is not so remote from other types of Mediterranean influence as the interior of the South-Eastern and Iberian peninsulas, since the plain of the Po opens widely to the Adriatic, and there is also a relatively easy outlet to the Mediterranean over the narrow Ligurian Alps. The names of Venice and Genoa call to mind the long history of the Mediter-

anean trading routes and their landward continuations over the North Italian Plain and the Alps. Moreover, Mediterranean culture and the Latin language spread over the great plain of northern Italy in classical times more thoroughly than the Greek language and culture were ever able to spread over the difficult mountainous

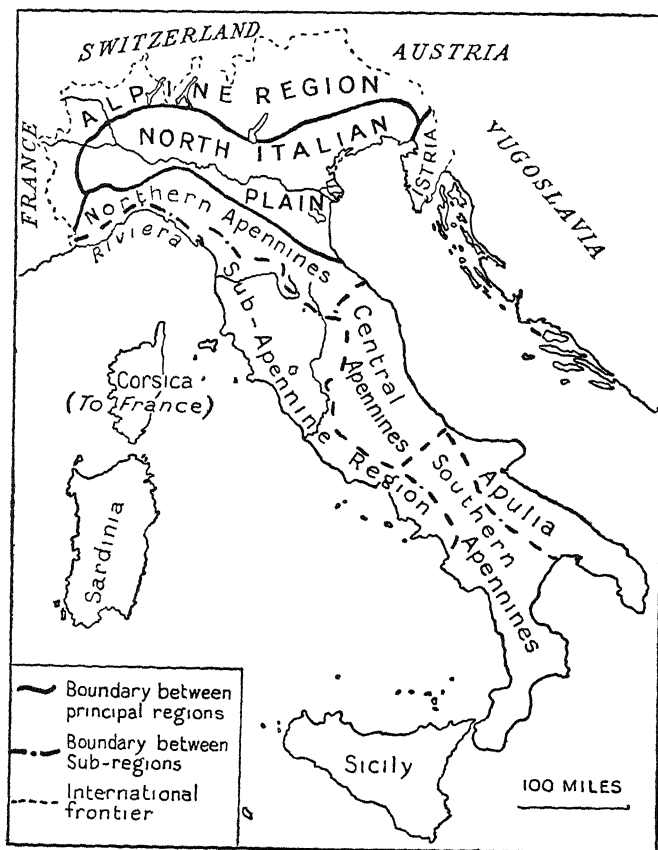


FIG. 13.—ITALY, SHOWING THE MORE IMPORTANT NATURAL REGIONS

interior of the South-Eastern peninsula, and, what is more important, Mediterranean culture and a language based on Latin have managed to retain their hold in spite of repeated invasions from across the Alps.

Relief and Structure.—Italy falls into three main structural regions: (a) the folded Alpine zone which is dealt with in the section on the Alps (*see* Chapter XXIII),

(b) the North Italian Plain or Plain of the Po, an area of young undisturbed sediments, (c) the folded Apennine zone, which comprises almost the whole of the Italian peninsula, Sicily, and the adjacent islands. The exact tectonic affinities of Sardinia are not very clear, but the



FIG 14—STRUCTURAL DIAGRAM OF ITALY

[After O. Maull.]

island may be treated as part of a "median mass," together with the similar island of Corsica, which is politically French. Minor structural elements are to be found, particularly in the extreme north-east which falls within the Dinaric system, and in the south-east, where Apulia forms a platform of little disturbed rock.

The main folding of the Apennine zone occurred in late Eocene and early Oligocene times, but this period of land building was followed not only by pronounced denudation, but also by a retrogressive movement which caused the mass to sink below the sea once more, and at the end of Pliocene times only fragments remained above sea-level. The northern and middle Apennines were deeply penetrated by arms of the sea and the southern Apennines were represented by an archipelago of small islands only. The subsequent re-elevation, which took place unequally, brought to light the clays, sands, marls, and conglomerates which were deposited in the surrounding shallow seas and straits, and these deposits now form a large part of the surface of peninsular Italy. The older of these unconsolidated rocks (Miocene) were lightly folded, but the younger escaped folding entirely.

The backbone of the peninsula contains the severely folded rocks of the preliminary folding, and these stand out as the main ridges of the peninsula, largely owing to the presence of much resistant limestone. In the northern Apennines, however, the main chains are largely composed of Flysch and similar rocks, which weather more easily than the limestones and form lower and more dissected chains. Very few parts of the Apennines show a really Alpine or high-mountain character, though the preponderance of limestones helps to give a wild appearance. There was relatively little Quaternary glaciation, the best example of the resultant Alpine forms being in the mass of the Gran Sasso d'Italia (9,584 feet). Geologists have recently recognised nappes in the Apennines, but they have little geographical significance.

The main Apennine chains swing in a wide curve from the Gulf of Genoa across the peninsula towards the Adriatic, enclosing between themselves and the Tyrrhenian Sea the hilly area known as the Sub-Apennine region, which includes within it the volcanic zone of Latium and Campania. On the Adriatic side the land falls to the sea-coast by means of the young Tertiary zone which is very much dissected into foothills. Then the main chains cross over once again to the western side, leaving on the east in Apulia a platform of little folded, little dissected limestone, which was not involved in the main Apennine folding, but was raised *en masse* with the second upward movement. On the south the chains run up against the crystalline masses which fill up almost the whole of

Calabria. A similar, but smaller, mass forms the north-east corner of Sicily, but disappears westwards under the Apennine folds which border the northern coast of that island. In Sicily, young volcanic deposits are found exceptionally on the outer, here the southern, side of the arc, whereas in peninsular Italy Monte Vulture is the only evidence of recent vulcanism lying on the outer side. The rest of southern Sicily is taken up by young Tertiary material similar to that on the eastern border of the eastern Apennines in peninsular Italy.

The Apennine chains are easily penetrated and crossed by means of depressions, usually former arms of the sea. The main fracturing, however, was on the western side, bordering the Tyrrhenian Sea and round the coasts of Sicily, where volcanoes mark the zones of extreme instability. Vesuvius is the only active volcano of the European mainland, but is neither so high nor so imposing as Etna (10,739 feet) in Sicily. The small island of Vulcano, off the coast of Sicily, gave its name as a generic title for this type of mountain. The numerous earthquakes of southern Italy demonstrate also that mountain building is not yet at an end.

Sardinia and Corsica consist mainly of old crystalline masses, but Corsica contains young folds in the north-east, and Sardinia has similar folds in the south-western corner. The latter island also contains a region of young, volcanic deposits in the north-west. A tiny fragment of ancient crystalline material is found in Elba.

It is not now considered that these scattered fragments of ancient crystalline rock affected the direction of the Apennine folds. It is thought more likely that they are part of a "median mass" which has foundered elsewhere, though they are considered by some authorities to be similar to the interior crystalline blocks of the western Alps, *e.g.* the Mont Blanc massif.

North of the Apennines lies the geosyncline of the North Italian Plain. It is evident that in late Tertiary times the shallow Adriatic Sea extended far west of its present limits, but a slight elevation, coupled with tremendous deposits of waste material from the bordering mountains, brought the present plain into being. Most of the material composing the plain is derived from the Alps rather than the Apennines owing to the greater height of the former range, and, in consequence, there is generally a slight slope southwards as well as eastwards, so that the

River Po flows nearer the southern than the northern border for the greater part of its course through the plain. Even this tranquil zone of plain shows some evidences of disturbances in two tiny groups of volcanic hills, the Monti Berici and Monti Euganei, of early Tertiary age.

Climate.—In climate the northern plain and the Alpine region are clearly marked off from the peninsula and islands. In the northern plain the winters are as cold as those of London, and often raw and foggy, though the influence of the Adriatic gives Venice and the coastal zone rather higher winter temperatures.

	Altitude in feet	Latitude	Mean Monthly Temp in degrees F		Annual Rainfall in inches
			Jan	July	
Venice .	sea-level	45° 26'	37	75.5	29.3
Milan	482	45° 28'	32	75	39.7
Alessandria	322	44° 54'	31	74.5	25.5

The rainfall is well distributed throughout the year.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Venice	16	16	20	24	29	30	23	25	28	36	27	19	29.3
Milan .	24	23	27	34	41	33	28	32	35	47	43	30	39.7

In the Alpine region temperatures naturally vary according to altitude and aspect. The foothill zone and the deep southward-opening valleys of the southern border of the Alps between Lake Maggiore and Verona, and even further east, have milder winters than the northern plain, owing to the shelter given by the Alps.

MEAN MONTHLY TEMPERATURE IN DEGREES FAHRENHEIT

	Jan	July		Jan	July
Bergamo . .	36	73	Bassano . .	37	77
Desenzano (Lake Garda) .	37	74.5	Conegliano .	38.5	73.5

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The rainfall, however, in this sheltered zone is heavy as in the Alps, and there is no dry season.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Como	29	38	46	65	79	60	52	50	63	76	61	37	65.6
Lugano (Switzer land)	26	22	40	63	70	73	63	72	76	82	54	28	66.9

In peninsular Italy there is a considerable contrast between the northern portion, north of about the latitude of Naples, and the southern portion, including Sicily. In the former the winter temperatures are rather low even on the coasts, especially on the east coast.

MEAN MONTHLY TEMPERATURE IN DEGREES FAHRENHEIT

	Latitude	Jan	July		Latitude	Jan	July
Leghorn	43° 32'	45	76	Ancona	43° 37'	42	78
Viterbo	42° 25'	41.5	73	Chieti	42° 21'	39	73

At any considerable altitude temperatures are naturally much lower :

	Jan	July	Latitude	Altitude in feet
	° F	° F		
Vallombrosa	34	63.5	43° 44'	3,132
Camaldoli	32	64	43° 48'	3,647

The rainfall here is definitely seasonal with a maximum in autumn and a marked dry season in summer, which, however, is not so severe nor so long as in southern Italy.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Florence	27	25	30	31	30	21	14	20	33	43	43	33	35.0
Rome	32	27	29	26	22	16	07	10	25	50	44	10	32.7

The Riviera coast forms a definite sub-region with considerably higher winter temperatures.

Genoa	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temp	46°	48°	52°	58°	63°	70°	75°	75°	71°	62°	53°	47°	60°
Rainfall	4.2	4.3	4.1	4.1	3.4	2.7	1.6	2.4	5.0	7.8	7.4	4.8	51.8

Southern Italy, including Sicily, is distinguished by the long period of summer drought, small number of rain-days and high winter temperatures, especially in Sicily.

	Latitude	Jan	July		Latitude	Jan	July
Naples	40° 52'	° F 46.6	° F 75.2	Messina	38° 11'	° F 53	° F 78.5
Bari	41° 16'	46.5	75.5	Trapani	38° 1'	54.5	77

Higher stations naturally show lower temperatures :

	Jan	July	Latitude	Altitude in feet
Potenza	° F 37	° F 69	40° 48'	2,711
Caltanissetta	43.5	76	37° 30'	1,871

In the extreme south there are usually three months in summer with less than one inch of rain.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Caltanissetta	4.1	2.9	2.2	1.8	1.5	0.4	0.2	0.5	1.2	2.5	2.8	3.9	24.1

One of the striking facts that emerges from a study of Italian climatic statistics is the similarity of the summer temperatures, for almost the whole of Italy, apart from high mountains, has a mean July temperature of about 70° to 75° F.

A—CONTINENTAL ITALY

The Transition Zone between the Northern Plain and the Alps.—A number of morainic amphitheatres lie at the exits of the great Alpine valleys. Behind these

terminal moraines lie depressions often filled by the great Italian lakes, and elsewhere presenting a ground moraine landscape. The rivers have cut through the morainic walls in rather deep valleys with a considerable gradient, consequently water power can be developed here, *e.g.* at Paderno d'Adda. These morainic hills do not merge into each other as on the northern side of the Alps, and between them the rock material varies from bastions of solid rock to coarse detritus of many kinds brought down by mountain torrents. On the Apennine side there are no morainic hills and the transition between the plain and the mountain takes place rather more quickly.

This encircling zone of hill country is terraced for cultivation wherever the exposure is favourable and it is mainly a land of vines and orchards. A fair amount of timber is to be found on poor soils and in poor positions. Bare slopes and patches of neglected, sterile ground are also to be found, particularly on the Alpine side.

The Alpine valleys, especially between Lake Maggiore and Lake Garda, though properly belonging to the Alpine zone, may be treated here, since they prolong the lowland zone into the mountains, and have some of the features of the Mediterranean climate. The mountains give sufficient shelter against cold winter winds to allow the olive to grow, a tree which is almost entirely absent from the North Italian Plain owing to the winter cold. But the mean January temperatures, even in this sheltered zone, are rather low (*see* p. 50). The rainfall is heavy and the distribution is non-Mediterranean, there being no dry season or month, and the summer six months (March–August) having a heavier rainfall than the winter. The months of maximum rainfall are usually May or June, with a pronounced secondary maximum in October. The climate may be called pseudo-Mediterranean. A number of tourist centres have grown up round the lakes.

The Plain.—The plain itself is 250 miles long from the foothills of Piedmont (It., Piemonte) to the mouths of the Po, about 50 miles wide in Lombardy (It., Lombardia), and about 120 miles wide in the longitude of the Po delta. The plain of Venice (It., Veneto) prolongs it in the north-east for another eighty miles, with a width of about thirty miles until the karstic hills of Istria are reached.

The plain is generally very flat except for the Tertiary hills of Montferrat (It., Monferrato) in Piemonte, which

could more properly be included in the Apennine system, and the little volcanic Monti Berici and Monti Euganei in the province of Veneto. It is also low-lying, and a rise of 300 feet in the level of the sea would restore almost the whole area to its former state as an extension of the Adriatic.

The plain may be divided into four zones of unequal width, running mainly east to west. From the Alps towards the River Po the alluvial material of which the plain is composed becomes progressively finer, but usually so gradually that the conventional division into a northern zone of gravels and a central zone of fine silt is somewhat artificial, and a division based on capacity for irrigation is



FIG. 15.—VIEW IN THE PLAIN OF LOMBARDY, SOUTH OF PAVIA

The trees planted in rows are mulberries. The light-coloured patches are irrigated strips growing rice. The line of the Apennines is visible in the distance.

more valuable. There is, indeed, usually a marked contrast between the central part of the plain which is irrigated, and the zone to the north which is unable to obtain irrigation water, but the irrigation zone extends northwards in places into the zone of coarser material. It may seem strange at first sight that a plain which has a considerable rainfall, well distributed throughout the year, should need irrigation. Summer temperatures are high, however, usually over 70° F. for three months, and while it is true that some crops, such as mulberries, wheat, and hemp, usually grow perfectly well without irrigation, it is essential to such crops as rice, and greatly increases the yield of others, particularly the forage crops.

The boundary between the arid and the irrigated zones

corresponds roughly with a line of springs, which occur where the water table cuts the north to south slope of the plain. In western Lombardia these springs occur in a band about six miles wide in the latitude just north of Milan. These springs, known as *fontanili*, increase in importance from east to west, and they play an important rôle in the irrigation of the plain, though the greater part of the water is derived from the rivers coming down from the Alps. In the north of the "dry" zone these rivers are too far below the level of the plain for their water to be diverted economically, but the southern part of the "dry" zone has generally been brought into the irrigation system, the most northerly canals, *e.g.* the Canale Villoresi in Lombardia, running north of the *fontanili*.

The Dry Zone bordering the Alpine Foothills.—This forms a narrow band all the way from Piemonte to eastern Veneto, inclusive. It is usually composed of permeable, rather infertile gravels, but also contains some impermeable material, *e.g.* in parts of Piemonte. Originally forested like the rest of the North Italian Plain, it was long ago cleared, and there are considerable areas of heathland in the most arid parts, though some re-afforestation is in progress. For the most part the area is cultivated, and mixed farming is the rule, with wheat, maize, rye as the typical cereals, some meadowland, vineyards, and mulberry trees, though in a few localities one type of farming predominates over another, as, for instance, the great concentration on mulberries in the district round Monza, in Lombardia. The population density is generally below the average for the plain, except where manufactures have arisen.

The Irrigated Zone borders the arid zone on the south. Some of the canals date from the Middle Ages; for instance, the Naviglio Grande, between the Ticino and Adda, was cut in the twelfth century, but the largest were mostly constructed in modern times. The Cavour Canal, running between the Po and the Ticino, built in the middle of the nineteenth century, is fifty-three miles long, and transformed an almost barren region of 380,000 acres of sand and gravel into the most fertile rice-fields and meadowland of Italy, where the best Parmesan and Gorgonzola cheeses are produced.

The North Italian Plain presents the largest area under irrigation in Europe and the greater part of Italy's 4½

million acres of irrigated land are to be found here, but as in all such irrigation areas, the imposing network of canals which appears on the map resolves itself down on the spot to inconspicuous ditches bordering a field. In spite of its extreme flatness, the plain does not present a monotonous aspect. Although there are usually no hedges, each field is bordered and traversed by lines of trees of various kinds, such as elms and mulberries, with an occasional Lombardy poplar, so that the cultivated foreground seems to dissolve into a pleasant woodland. The small fields are occupied by strips of crops of different form and colour, such as rice, maize, flax, clover, wheat, lucerne, with patches of bare, brown soil, occasionally glinting with irrigation water, if the season be early enough. In the distance a village is usually to be seen, its harmonious grouping of buildings half hidden in its setting of trees. Occasionally the usual mixed cultivation gives place to monoculture, as in the irrigated rice-fields of Piemonte bordering the River Po, but this is rather exceptional. The vine is grown to some extent everywhere, but particularly between the Mincio and Oglio, and the latter river and the Po, *i.e.* the Mantua region (It., Mantova).

In connection with the forage and grain crops, there are important dairying and poultry industries. In this region of intensive agriculture the cattle are seldom seen in the fields, but are stall-fed, and the milk is either converted into butter, which is largely sent to other parts of Italy, or into cheese, which is largely exported.

The Zone of Drainage, or the Fen Zone.—The irrigated region is succeeded along the River Po by a zone requiring drainage. This zone is triangular in shape with its base along the Adriatic, its axis along the River Po, and its apex in the rice-growing region of Piemonte. Irrigation is also practised here, but the surplus water must be disposed of. In the "old" delta of the Po, between the River Adige and River Reno, the effort at drainage goes back to classical times, and the dykes were mainly completed before the modern era. In appearance, this zone does not differ markedly from the irrigated zone already described, though hemp and beet sugar take a larger place among its crops. Along the coastal strip, however, the swamps and lagoons behind the coastal sand-dunes defied all efforts at reclamation until steam pumps were employed in the middle of the nineteenth

century, and the region has still a raw appearance. Its treeless surfaces, crossed by straight, apparently endless roads, are the domain of the vast estate, and are worked mainly with modern machinery, instead of the ox-drawn plough and spade used in the rest of the plain. The most difficult areas still await reclamation.

Emilia.—The remaining section of the plain is also triangular in shape, being bounded by the Fen zone on the north and east, and by the Apennines on the south. It has only scanty supplies of water available for irrigation, since its streams come from the Apennines and are small and usually almost dry in summer. Where possible, however, especially near the Apennines, irrigation water is utilised and great new works were completed in 1929. Products are rather similar to those of the irrigated zone, except for the absence of rice. Sugar-beet assumes a much larger place than elsewhere in the plain, and hemp is almost confined to this province, other more profitable cultures having taken its place in the regions possessing a greater water supply.

Town Sites.—In a level plain of this kind the distribution of settlements is apt to be somewhat sporadic. Certain lines of towns may be distinguished, however, of which those along the foot of the mountains are the most obvious. In the case of the Apennine side they lie at the crossing points of the old Roman Via Æmilia, which skirted the foothills, with routes across the mountains. Such towns are Rimini, Forlì, Faenza, Bologna, Reggio, Parma. The central line, which one might expect to find along the main river, is incomplete, owing to the danger from inundation, and there is no town actually on the Po below Piacenza, though Cremona is very near the river. In Lombardia a number of settlements stand in the region of junction between the dry and the irrigated zones. Of these the most important is Milan (It., Milano; 1, 116,000).¹ There seems to be no particular geographical reason why this city stands *exactly* where it does, but it is well situated in regard to routes. Upon Milan focus two out of the five main railway lines across the Alps, namely the St. Gothard and the Simplon. The Splügen, Maloja, and Bernina Passes also lie to the north of Milan and ~~were~~ were much used in the Middle Ages. The city is a great banking and commercial centre, has varied industries, such as motor cars and textiles, without

¹ Population figures are those of Census 1936.

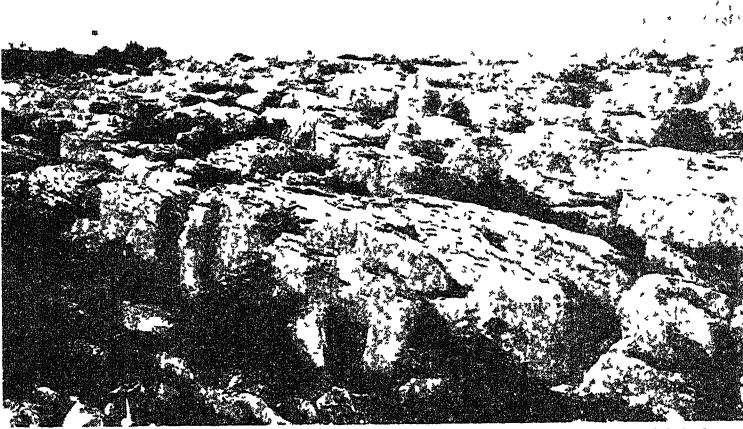
any one being dominant or of really great importance. It is rather the headquarters of a ring of smaller manufacturing towns and villages, and may be looked upon as the capital of the plain and of Italian commercial life. It is celebrated as a musical centre. The immediate advantages of the site of Turin (It., Torino ; 629,000) are more obvious. It stands at the junction of the Po with the Dora Riparia, whose double-headed valley leads up to the Genève Pass in the south and the Mt. Cenis Pass in the north, the latter route being now used by a railway, though the actual Mt. Cenis Tunnel is under the Col de Fréjus. The Montferrat Hills (noted for their vineyards, which produce Asti) to some extent restrain routes from leaving the Po Valley for some distance above and below the city. It carries on active commerce and manufactures, particularly of textiles and machinery, including motor cars.

The North Italian Plain, particularly those parts of Lombardia and Piemonte bordering the Alps, is the most active manufacturing zone of Italy. This development is of very modern growth and has little connection with the mediæval handicrafts. It depends for its power on hydro-electricity, transmitted from the Alps, consequently the factories are very dispersed as there is a wide choice of site. Textiles, particularly cotton and artificial silk, are the chief lines of industry, and the names of Gallarate, Busto Arsizio, Legnano, Monza, Bergamo, and Brescia in Lombardia may be mentioned in this connection, while in Piemonte the towns of Chieri, Novara, and Gaiete are of considerable importance. The real silk industry, centred in the town of Como, has its roots in the past, but has been completely transformed, and there is very little manufacture of the woven article, most of the silk being exported merely as "thrown" silk. Italy is the leading European producer of raw silk and the third in the world.

Most of the international traffic of the plain goes *via* the Alpine railway routes, but the main sea outlet is Genoa (It., Genova) and not Venice (It., Venezia ; 264,000). Like most ports at the seaward end of a growing plain of deposition, Venice is handicapped by shallow water and the constant deposition of silt (*cf.* Calcutta, Shanghai). The old mediæval town, built on piles driven into mud flats, is now little more than a tourist centre, living on a glorious past, but a modern town and port is being built on the mainland. Trieste has to a considerable extent

taken the place of Venice in connecting the Adriatic with the eastern Alpine lands and beyond.

Peninsula of Istria and adjoining Italian Lands.— This area belongs structurally to the Dinaric system. The roots of the peninsula consist of a waterless limestone plateau known as the Karst (It, Carso), which gave its name to similar land-forms elsewhere. Parallel to this to westward lies a Flysch-filled depression, and westward again lies another limestone zone along the coast. North-east of the Carso another Flysch-filled depression rises to a high karst region which separates the Adriatic lowlands



[Courtesy Touring Club Italiano.]

FIG. 16—VIEW IN THE CARSO OF EASTERN ISTRIA.

The very pure limestone, almost devoid of soil, is typical of much of the Dinaric system in Yugoslavia also

from the Danubian lowlands and forms a saddle between the high mountains of the Alpine chain and those of the Dinarics. The railway over the saddle from Austria *via* Laibach (Ljubljana) to Trieste and Fiume crosses it at a height of less than 2,000 feet ; in other words, this is the lowest pass in the whole Alpine-Dinaric system. To the north of this saddle lie the famous mercury mines of Idria.

At either end of the peninsula of Istria lies an important port, Trieste (248,000) on the west, and Fiume (53,000) on the east. Trieste has an artificial harbour but lies out of the way of the silt of the Isonzo and other rivers of

Veneto, as the current sweeps from east to west. Trieste was formerly the chief port of Austria, and now that it has become Italian its hinterland is restricted. Fiume, which is closely hemmed in by mountains, was formerly the port of Hungary. Its suburb, Sušak, now provides a port for Yugoslavia, but the steepness of the slope inland up the mountains limits the usefulness of the rail connections.

Italy also obtained in 1919 a number of islands along the eastern coast of the Adriatic, of which the most important are Lussin, Cherso, Lagosta, Cazza, and Pelagosa. In addition, she obtained a number of footholds on the mainland, particularly Zara and the entrances of the Bay of Valona. Her claims to these places in the eastern Adriatic are based on the considerable number of Italian-speaking people here, especially in the towns.

B—THE APENNINE PENINSULA

It cannot be said that any very satisfactory division into geographical regions presents itself, largely owing to the rapid alternation of high and low relief, which results in a mosaic of contrasting land-forms and climates. A division into central and southern Italy can be justified to some extent on climatic and other grounds and will be adopted for the sake of convenience in treatment.

Central Italy. (i) The Apennines.—*The Northern Apennines and Ligurian Alps.*—These mountains present an obstacle to communication between the great plain of northern Italy and the Ligurian Sea on the one hand, and between the great plain and the small fertile basins of peninsular Italy on the other. But it is a narrow barrier in which there are many gaps, heavy weathering being largely responsible for producing a number of low passes.

Behind Genoa (It., Genova) there is a low saddle threaded by several easy passes, a circumstance which greatly assisted the rise of that port. From a tectonic point of view the Ligurian Mountains belong in their western section, roughly west of Savona, to the Alps, but from a geographical point of view they may be treated as a simple extension of the Apennines. The Ligurian Mountains border the sea so closely that the houses of the main residential part of Genoa are perched on the steep slopes behind the scanty lowland on which lie the present business quarters and the old town. Practically all agricultural land has had to be obtained by terracing. The absence

of any coastal plain is evident from the fact that the coastal railway between Genoa and Ventimiglia, on the Franco-Italian frontier, passes through more than seventy tunnels, while the many mountain torrents which had to be bridged added to the difficulty of construction. Owing to the protection given by the mountains against cold northerly winds, the coastlands present a southern vegetation with olives, tangerines, palms, etc., but the rainfall is high (Genoa, 52 inches) and there is no dry season. There are many tourist resorts, but commercial and industrial interests are centred in Genoa (635,000), which is the main port for the North Italian Plain. Although any extension of its harbours can only take place at the expense of the sea, yet Genoa is free from the



[Courtesy Touring Club Italiano]

FIG. 17—THE "BADLANDS" OF SASSUOLO IN THE TUSCO-EMILIAN APENNINES

continuous fight against silt which has almost defeated Venice, and has the further advantage of being nearer to the industrialised western end of the North Italian Plain. It is the chief port of Italy for goods traffic, and stands next to Marseilles and Naples among Mediterranean ports for passenger traffic. Its suburbs possess ironworks and there are similar factories at Savona and smaller places along the coast. The use of scrap iron and English coal explains the coastal position of these factories.

East of Genoa the Ligurian Mountains are higher and broader and consist of numerous chains trending from north-west to south-east, roughly parallel with the coast. Communication across these chains is difficult, hence Spezia, though possessing a splendid harbour, has no long commercial history behind it, and though it is

now connected by rail with the North Italian Plain, it is used chiefly as a naval port. ✓

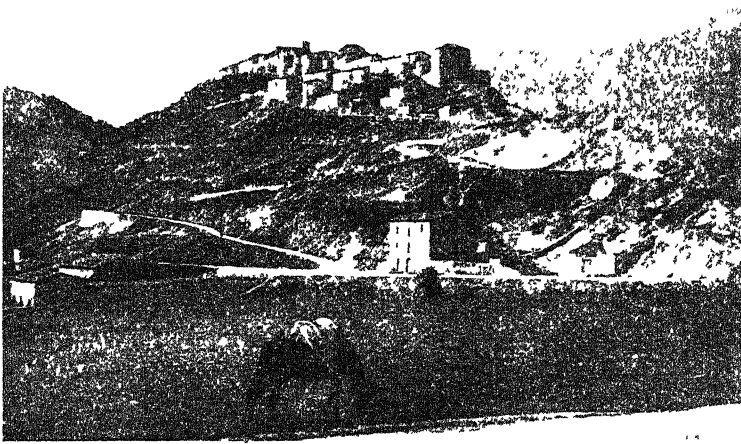
These mountains continue between the River Taro and the River Metauro as the Etruscan Apennines. The chains have a north-west to south-east strike and consist mainly of soft sandstones, clays, and chalk marls, together with narrow bands of serpentine. The country is highly dissected, hilly rather than mountainous, since the rocks do not lend themselves to harsh forms, and landslides are frequent in the clay zones. The western stretch between the River Taro and the Pistoja-Bologna railway, however, has considerable areas over 3,000 feet, and Monte Cimone reaches 7,097 feet. The landslide type of country produces "badland" topography, so-called from the similar formation which prevails on a large scale in South Dakota (U.S.A.). The northern side is seamed with many short, transverse valleys, but on the inner side are developed longitudinal valleys with the characteristic north-west to south-east strike, and these lead down on the south to the basins of Tuscany, and on the north lead up to easy passes. Communication is, therefore, easy, apart from the danger of landslides, and there are many historic routes between the Florentine basin and the North Italian Plain. The main railway line follows the Reno valley, south of Bologna.

The Etruscan Apennines carry considerable forest, especially behind Florence. Precipitation occurs all the year round, and snow may fall in April or even later, so that deciduous trees prevail, especially the sweet chestnut, while the summits are clothed with conifers. The autumn leaves of Vallombrosa strew the ground as thickly to-day as in Milton's time.

The Central Apennines.—South of the Etruscan Apennines the mountain belt begins to widen and to change in lithological character, though on the west two parallel chains continue the same types of rock into Umbria.

Eastward, however, begin the limestone ranges which predominate throughout the rest of the system as far as the granitic mass of Sila in Calabria, and which are especially high and rugged in the Abruzzi; Monte Corno, in the Gran Sasso Range, reaching 9,584 feet. The highest of these limestone mountains present Alpine features, but generally they form formidable blocks whose steep, rugged sides are crowned with plateau-like or rounded surfaces. Considerable karst areas have been developed,

and usually the higher limestone zones now carry only sheep pasture. The whole zone is penetrated by the same type of longitudinal depressions that are so frequent in the Etruscan Apennines. The upper Tiber valley, the basins of Foligno and Rieti, the valleys of Aterno and the Upper Liri and others allow penetration, and when drained are themselves of great fertility. It is, however, much more difficult to cross the peninsula in the Abruzzi than farther north, owing to the greater height of the mountains



[Courtesy Touring Club Italiano]

FIG 18—OFI IN THE APENNINES OF THE ABRUZZI

A hill village typical of many in the Mediterranean region

and the poverty of transverse valleys, which in turn is due to the incomplete system of surface drainage in this country of porous limestone.

The Eastern Slope of the Apennines.—The land between the high Apennines and the Adriatic descends by a series of not very well defined terraces, and is a region of very complicated dissection developed in the almost undisturbed young Tertiary clays, shales, and sands. It is a fertile, well-cultivated, well-peopled region, but, owing to the lack of level land, it does not lend itself to the development of large centres of population. The coast, bordered by low cliffs, is harbourless, apart from the port of Ancona (89,000), where a limestone promontory exceptionally occurs and gives rise to a bay.

Central Italy. (ii) The Sub-Apennine Region.—Between Spezia on the north, Monte Circeo on the south, and the Apennines on the east lies a particularly broad segment of the Apennine foreland. Although in places it reaches heights comparable with the Apennines themselves, it is generally lower, more fertile, and includes some of the most densely populated areas in the whole of Italy. Its curving eastern margin is well marked by the depression of the Val di Chiana and by the lower and the middle course of the Tiber, but the hill-country of Umbria may also be included from the geographical, though not from the geological, point of view.

The Sub-Apennine region rose later than the main Apennine zone and consists of a number of fragments, formerly separated by arms of the sea, but now joined together by depressions, which are filled by Quaternary sediments and by alluvium. The general strike is north-west to south-east, as in the Apennines, and the preliminary folding took place at the same time. The disturbance in drainage consequent upon the later uplift led to a somewhat complicated system of river capture to which the Val di Chiana owes its depth, though not its initial outlines. The Sub-Apennine region is mainly hilly country set with basins and narrower lowlands, but is so very diverse that it is particularly difficult to give any generalised description, and maps on a scale of at least 1 : 100,000 are necessary for its study.

The Arno Basins.—The northern basins along the course of the Arno, centred on Florence (It., Firenze, 323,000), are the regions of densest population. The basin of Florence was formerly occupied by a lake. It was still marshy as late as early Roman times, and the early centres of population, such as Fiesole and Pistoja, were placed on high land round the margins. The floors of these basins are of great fertility, and so are many of the neighbouring hills, the Monti Chianti, for instance, being celebrated for their wine. It may seem curious that no city in the neighbourhood came into real prominence until mediæval times, since Florence in many respects has a better position than Rome for acting as capital of Italy. But this Etruscan region was prevented from enjoying its advantages of position by a number of disadvantages, among which may be enumerated the presence of the early marshes, the openness to attack from barbarians arriving from the north, and the late development of the North Italian Plain.

Mediæval Florence owed its wealth primarily to the fertility of the surrounding country and to the good use made of its nodal position with access north over the Apennines, south *via* the Val de Chiana and west *via* the Arno. The manufacturing, banking, and artistic ability of the Florentines brought the city wide fame, but the present town is mainly a tourist centre living on its glorious past. The Arno has built a delta at its mouth whose continued growth has led to the decay of Pisa as a port, and the town of Leghorn (It., Livorno; 125,000) has taken its place. The delta was formerly malarial, but is now almost immune from that disease.

The Alpi Apuane.—North of the Arno delta stretch the Alpi Apuane, separated by a depression from the Etruscan Apennines. These form one of the few really high and mountainous parts of the Sub-Apennine zone, the Triassic limestones of which they are largely composed having weathered into rugged forms. In places the limestone has been altered into marble which supplies the famous Carrara marble used in sculpture.

The Hill Country of Tuscany.—South of the Arno lies the hill country of Tuscany (It., Toscana) with Siena (48,000) almost centrally placed. The area is of moderate fertility. The Catena Metallifera Toscana, or Tuscan Ore Mountains, contain fragments of rocks as early as Permian, and there has been a good deal of igneous intrusion, which has cut through all the strata up to the Eocene. Many minerals are connected with these veins, *e.g.* copper, silver, zinc, iron, tin, and mercury, of which the latter alone is important at the present day, though many of the others were of great historic and prehistoric significance.

The Umbrian Hill Country.—The hill country of Umbria belongs by origin to the central Apennine zone, but in virtue of its rather low relief is best included geographically in the Sub-Apennine region. The landscape consists mainly of hilly country formed out of Flysch and studded with many basins, such as those of Rieti, Perugia, Foligno, though the towns themselves, such as Assisi and Perugia, are usually placed on hills above the basin floors, which tend to be swampy and malarial. The Monti Sibillini, however, on the east of Umbria reach a height of 7,800 feet, and already show the limestone formation which is so characteristic farther south in the Abruzzi.

The Volcanic Region of Lazio and South Tuscany.—South of the River Ombrone (not to be confused with the

other Ombrone, a tributary of the Arno) is Monte Amiata, the most northerly of the line of volcanoes which extends as far south as Vesuvius, though active vulcanism is only found in the Neapolitan region. North of the Lower Tiber this volcanic hill country reaches almost to the sea, but in front of the Alban Hills and Monti Lepini (the latter only partly volcanic) stretches the plain of the Campagna Romana and the Pontine Marshes. These lowlands are desolate and malarial in contrast to the

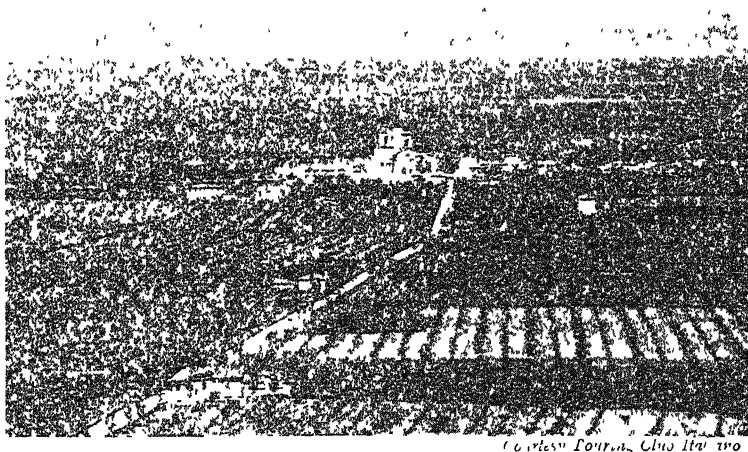


FIG 19—THE PLAIN OF ASSISI

This small fertile plain surrounded by hilly country is typical of many in Peninsular Italy. The view is taken from the town of Assisi, which is characteristically built on a hill.

well-populated hill country, but are now rapidly being reclaimed. The Pontine Marshes have apparently been fen country during the whole of historic times, but the Campagna Romana provided the main food supply for ancient Rome, at least throughout the Republican period of its history.

The city of Rome (It., Roma; 1,156,000) itself grew up on little hills of volcanic material, but the fact that the Tiber here breaks through the hilly Apennine foreland was one of the principal factors in the evolution of the city. Rome was in the best position of any town in Italy to

gain control of the whole peninsula in early times, since it stands on the largest river with the most extensive drainage area, and is centrally placed in regard to the length of the peninsula. At the present day the centre of gravity of the country, as regards population, education, and wealth, lies not in the peninsula at all, but in the North Italian Plain, and the choice of Rome as capital of the whole country in 1870 must be looked upon as a tribute to the glory of its historic past. In population it was until very recently smaller than either Milan or Naples, but it is growing rapidly as a result of its restoration to the position of capital, and is now (census 1936) the largest city of the country.

Southern Italy.—Between southern and central Italy there are a number of differences which, though not very marked in themselves, have the cumulative effect of producing a different environment. New land-forms appear, notably the platform of Apulia, the crystalline moorlands of Calabria, the volcanic areas of the Neapolitan region. The climate also differs somewhat in having rather warmer winters and drier summers, thus further restricting the extension of broad-leaved trees, but allowing the cold-hating orange to flourish, whereas this fruit is not at all happy even in central Italy or the Riviera. Further, southern Italy is backward culturally, having been unintelligently exploited by its Hapsburg and Bourbon masters up to the middle of the nineteenth century. It has poor communications and is undeveloped industrially.

(i) **The Neapolitan Lowland.**—In southern Italy the Apennines cross over once more to the west coast, leaving a broad foreland on the east, but on the west allowing only the development of the Neapolitan lowlands and the small plain bordering the Gulf of Salerno. The Neapolitan lowlands are encumbered by the active volcanic areas of Vesuvius and the Campi Flegrei, but are very fertile (partly as a consequence of the volcanic material), and intensively cultivated. Naples (It., Napoli, 866,000) is one of the three largest Italian cities, and grew to importance as the administrative centre of the kingdom of Naples, or the "Two Sicilies." It attracts large numbers of tourists and has started new manufacturing industries, such as cotton and jute, but must be looked upon as economically over-populated. It is the second port of the country as regards tonnage, mainly owing to its passenger traffic.

(ii) **The Southern Apennines** differ somewhat from those of central Italy in showing few parallel chains, but many isolated blocks. This is consequent upon less intensive folding, but more numerous dislocations. In the Calabrian Apennines even the Eocene strata is unfolded, though it represents *par excellence* the folded rock of the Apennines elsewhere. Of the numerous depressions, that affording a route *via* Benevento, between the Neapolitan district and the east coast, is the most important. On the whole, the southern Apennines are lower than those of the centre, but Serra Dolcedorme reaches 7,451 feet. The crystalline masses of Sila and Aspromonte take up almost the whole of the Calabrian peninsula. They were probably once covered with both Secondary and Tertiary material, but this has been denuded from the rounded summits, though it is still found high up on the sides with consequent high extension of cultivation. The granite, gneiss, and mica schists of which these masses are composed probably once carried deciduous trees, such as sweet chestnuts, oaks, and beech, of which considerable remnants are still to be found in Aspromonte. Considerable areas of bog and fern-covered wastes occur, which, with the fields of rye and meadows devoted to dairy cattle, give the region a rather un-Mediterranean appearance, especially in wet weather. The seaward slopes are largely devoted to olives, and the narrow malarial coastal plains to irrigated lemon groves. Reggio (123,000), the crossing place to Sicily, is the chief town.

(iii) **The Apulian Foreland.**—Apulia (It., Puglia) consists mainly of a platform of lightly-folded limestone with residual soil on top, except in the higher (about 2,000 feet) north-western plateau, known as the Murge, where this red soil called "terra rossa" has been denuded.

Along the coasts of the Adriatic, the Gulf of Taranto, and in the whole of the Otranto Peninsula, the land is very fertile, intensively cultivated and very thickly populated. The main drawback is the lack of surface water, there being an almost complete absence of rivers, and although well water can be obtained, it is used for irrigation at the expense of domestic purposes. The recent vast achievement of tapping the head-waters of the River Sele, and leading them through a great tunnel over seven miles long through the Apennines, is remedying this deficiency to some extent. The cultivation includes large quantities of olives, considerable quantities of grapes,

and drought-resisting wheat of the hard durum type, as well as oranges and many kinds of vegetables. Apart from a portion of the olive crop, most of the food-stuffs are for home consumption. The coastal zone shows the striking grouping of population into large towns which is characteristic of the Mediterranean lands. Bari (197,000) and Taranto (106,000) are the largest, and Brindisi (42,000) is the well-known passenger port for Egypt and the Far East.

Between the Murge and the peninsula of Monte Gargano lies the Tavoliere (= "chess-board"), a flat plain along which flows the River Candelaro into lagoons without exit to the sea. Like the Campagna Romana, it is being reclaimed for agriculture, but up to recently was mainly used as winter pasture for the animals spending the summer months in the mountains of Abruzzi and Molise. Monte Gargano is mainly a mass of karstic limestone.

(iv) **Sicily.**—Sicily continues the Apennine region, from which it is separated by the Straits of Messina which narrow to less than two miles wide. Along the northern coast of the island stretch the Sicilian Apennines, mainly formed of limestone, but containing the gneissic massif of Peloritani in the north-east corner, and some Flysch. The mountains usually fall steeply to the north coast, but leave room for one or two small plains, of which that of Palermo has been celebrated for its beauty and fertility since ancient times. Palermo (412,000) is the chief port of the island, and communicates by rail across the mountains with the south coast.

The centre and south of the island consist mainly of a peneplane of young Tertiary material, denuded into a region of rounded hills. Limestone and Flysch strata occasionally emerge, and young volcanic material appears in the south-east while Mount Etna stands apart as a region on its own. This hill country was one of the great granaries of the ancient world and still produces much wheat. The lower lands produce large quantities of lemons and oranges, mainly requiring irrigation. Large sulphur deposits occur in the middle of the island, between Caltanissetta and Agrigento (Girgenti).

The active volcano of Etna is separated from both the Apennines and the Tertiary peneplane by tectonic depressions. It rises sheer from the sea to a height of 10,739 feet, and its summit is covered with snow for the greater part of the year. Its lower slopes produce large quantities of vines and olives and are densely peopled.

Sicily, like Apulia, shows to a remarkable extent, the characteristic concentration of the Mediterranean people into towns, even of the agricultural section of the population. Hence the astonishingly large size, for a small, purely agricultural area, of many of the Sicilian towns, *e.g.* Messina (192,000), Catania (245,000), Trapani (64,000), Caltanissetta (50,000).

The Tyrrhenian Islands.—Sardinia, Corsica, Elba, and the tiny Tuscan islands show a high proportion of infertile crystalline material, and are mainly mountainous.

The eastern half of Sardinia consists of mountainous country composed of granite, covered with heath and maquis, carrying only a scanty population engaged in sheep and goat rearing. This region sinks on the west to a hill country, largely composed of volcanic material, and thence on the north-west to the plain of Sassari (55,000). The north-west corner consists of a hill country of folded Palæozoic and Cretaceous material. On the south-west the crystalline mass sinks to the Campidano, the largest plain of the island, which crosses from the south coast at Cagliari (107,000) in a north-west direction to the west coast near Oristano. This plain is one of the most malarial districts of Italy, but is being taken in hand in connection with the great irrigation and hydro-electric scheme which has involved a great dam across the River Tirso. The south-west corner is a folded mountain zone of very varied material, varying from Palæozoic to Tertiary together with volcanic. Lead and zinc have been mined from early times. Sardinia is generally an unproductive and thinly populated country, and offers great contrasts to Sicily in both respects.

Corsica's granite mass lies on the west side of the island and sinks to a ria coast. The north-eastern side consists of folded mountains of a shaly character, separated from the granitic area by a longitudinal depression, which, however, is smaller and less important than that of Sardinia, and the population generally is even scantier. Population tends to avoid the narrow malarial coastlands and is mainly to be found in the zone between the 600-foot and 3,000-foot contours. About half the island is covered with maquis, which is often exceptionally tall and well developed here. The island of Elba consists of very varied material which contains considerable deposits of iron ore in the east associated with granitic intrusions. The tiny Tuscan islands are composed chiefly of granite.

Economic Summary.—Italy, with an area of 120,000 square miles and a population of 42 million (census, 1936), is about the same size and has about the same number of people as Great Britain, but has a much greater proportion of its inhabitants engaged in agriculture (56 per cent. as against 7 per cent.) The more favourable latitude partly accounts for this greater emphasis on agriculture, but also it must be remembered that Italy has practically no coal and was, therefore, handicapped as regards manufactures. Italy was also in an unfavourable position politically up to 1861, since there were five customs zones and the home market of each was therefore very small. In spite of these initial handicaps, modern Italy has developed quite important manufactures, particularly of textiles, and to a lesser extent of engineering, metallurgical, alimentary, and chemical products.

At the time of the formation of the Italian kingdom in 1861 there were hardly any survivals of the great mediæval manufactures which had made central and northern Italy the workshop of Europe. With the tariff unification of 1861 came the opportunity of a large home market, and the presence of a large amount of clever cheap labour and a favourable position on the Mediterranean route for importing English coal enabled Italian industries to begin development on modern lines. A second great impulse came with the discovery of the electrical transmission of water power, which greatly helped in the establishment of the Italian textile industry.

HYDRO-ELECTRICAL DEVELOPMENT IN ITALY
IN KILOWATT HOURS 1932

Northern Italy	.	.	.	7,060,465,000
Central Italy	.	.	.	1,506,495,000
Southern Italy	.	.	.	1,005,801,000
Sicily and Sardinia	.	.	.	148,074,000
Total	.	.	.	<u>9,720,835,000</u>

The textile industry is mainly concerned with cotton, artificial silk, and real silk, and is located principally in northern Italy, in Lombardian, Piemonte, Veneto, and Liguria, with isolated centres in Naples and other towns of central and south Italy. Italy comes fifth in Europe as regards the number of cotton looms, and is the only important European producer of raw silk, though finished silk goods are not yet very important. The metallurgical

and engineering industries are more scattered throughout the country than the textile, many ports possessing factories using imported coal, and Turin is also an important centre.

The alimentary industries are even more scattered, and include the preserving of vegetables (*e.g.* tomatoes), fruits, fish, the preparation of olive oil, wine, cheese, and the manufacture of beet-sugar.

Manufactured goods figure to a considerable extent in the export list, which usually shows cotton tissues in the second or third place. Raw silk, however, has been ousted from its position at the head of the list in favour of fruit and vegetables, while artificial silk has recently sprung into importance.

The import list used to be headed by wheat, but in 1933 the country became practically self-supporting as regards this cereal, and the imports of wheat have since been small. Minerals (including coal and coke), raw cotton and raw wool hold important places, followed by manufactured products of various kinds, *e.g.* mineral oils, machinery, cast-iron and steel.

It may be noted here that Italy's mercantile marine has undergone great expansion since 1918, and has ousted France from fourth place among European countries as regards tonnage of shipping, with a total of 3,213,000 tons in 1937.

In spite of the development of manufactures, the country can hardly support its 355 people per square mile, and there was a large pre-war emigration of about half a million a year. As the overseas countries are now restricting immigration, great efforts are being made to support the increase of population at home, and costly schemes of land reclamation, irrigation, and hydro-electrical development are being carried out. It is as yet too early to say whether the scheme to relieve congestion in Italy by colonising Abyssinia will prove successful.

MAPS AND REFERENCES

The 1/100,000 map published by the Instituto Geografica Militare is the most useful for general purposes.

Atlanti dei Tipi Geografici (Atlas of Geographical Types), by O. Armelli (Florence, 1922), gives maps of typical land-forms, but the much smaller *Saggio di un Atlante del Paesaggio Italiano* (Essay of an

Atlas of Italian Landscape), with English text, is more useful as an introduction and gives excellent photographs of typical land-forms (Published by the Comitato Geografico Nazionale Italiano, Touring Club Italiano, Milan, 1928)

There is no textbook on the regional geography of Italy in English. *La Penisola Italiana*, by T. Fischer (Turin, 1902), may be looked upon as the standard work, but is now rather out of date. There are sections on Italy in the books on Southern Europe given at the end of Chapter V. A number of volumes on the different natural regions are published under the title of *La Patria, Geografia d'Italia* (Turin, 1925 onwards)

Tome III (Part 2) of the *Géographie Universelle* series, entitled *Italie, Péninsule des Balkans*, by J. Sion (Paris, 1934), is an excellent modern work.

A paper by Attolico and Giannini on "The Industrial Position of Italy" (*J. R. Statistical Society*, vol. 81, 1918), includes an account of the rise of modern manufactures in Italy. A paper in *Nature*, September, 1930, by Brysson Cunningham, gives an account of hydro-electric power. "La Mise en valeur de la Campagne Romaine," *Annales de Géographie*, September, 1929, "Water Conservation in Sardinia," *Geographical Review*, 1926, and "Reclamation of the Pontine Marshes," *Nature*, vol. 135, 1935, pp. 980-984, are among the many papers giving accounts of the recent great reclamation schemes.

CHAPTER VII

THE IBERIAN PENINSULA

THE Iberian peninsula is the largest and most compact of the three southern peninsulas, and in contrast to the others it has the greater part of its area occupied by plateau. Consequently, in spite of being washed by the Atlantic Ocean as well as by the Mediterranean Sea, it is more continental than the Italian peninsula or than Greece and hardly less continental than the interior of the South-Eastern peninsula. The old saying that "Africa begins at the Pyrenees" sums up the plateau character, the aridity, the great treeless spaces, which are common to large sections of both regions, and the long sojourn of the Moors in Spain emphasised the likenesses between the Iberian peninsula and the lands on the southern side of the Mediterranean. The saying, however, is misleading, since the comparison is only with North Africa, and it is equally true that "Europe ends at the Atlas."

Relief and Structure.—The greater part of the peninsula is occupied by a mountain-ribbed plateau, averaging about 2,200 feet high, known as the Meseta (= "table"), which slopes gradually westward to the Portuguese lowlands from the Iberian Mountains which form the main water-parting of the peninsula. The plateau is bordered on the north by the lofty Cantabrian Mountains and on its southern edge by the lower Sierra Morena. It is also ribbed by two lines of high sierras running from east-north-east to west-south-west, the northern line being known under various names from the Sierra de Guadarrama in the east to the Serra da Estrella in Portugal, but may conveniently be termed the Central Sierras. The southern line, which is less imposing, is known in its two highest ranges as the Sierra de Guadalupe and the Montes de Toledo. The Central Sierras divide the plateau into two main basins, which are surrounded on all sides, with the exception of certain gaps in the west, by higher and more rugged country. The surrounding mountain rampart falls abruptly on its outer

sides either directly to the coast or to narrow coastal lowlands, as on the north and south-east, or to great depressions as on the east and south in the Ebro basin and Andalusian basin respectively. On the farther side of

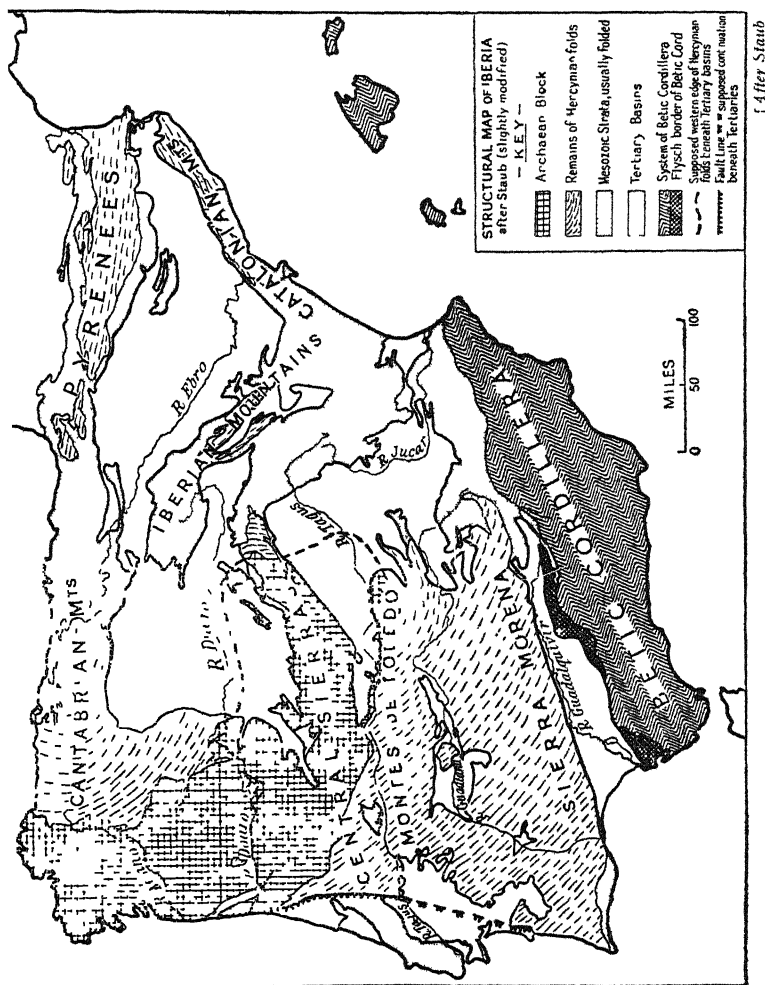


FIG 20.—STRUCTURAL DIAGRAM OF IBERIA

each of these depressions rise mighty mountain ranges, namely, the Pyrenees to the north of the Ebro basin, and the Betic Cordillera to the south of the Andalusian depression. Coastal plains are generally absent, although the swampy threshold of the Andalusian or Guadalquivir

depression borders the ocean, and there are lowlands midway along the Portuguese coast. There is also a conspicuous absence of deep bays and coastal indentations, except in the north-western corner of the peninsula, and in consequence good harbours are rare.

The structure of Iberia is a complicated one. Its geological history shows a long succession of mountain building extending from Pre-Cambrian to Tertiary times, with intervening periods of demolition, but generally speaking, the land-mass grew by accretions eastward or south-eastward.

The north-western part of the peninsula, comprising Galicia and northern Portugal, shows the roots of a Pre-Cambrian folded system similar to that of the Baltic shield and consisting mainly of crystalline schists and granites. The greater part of the Central Sierras also show these old rocks on the surface. There are also traces of a folded zone of Caledonian age, but these are very scanty and completely overshadowed by folded rocks of the next great period of earth disturbance, namely, the Hercynian, which took place at the close of Carboniferous times. According to R. Staub, the Hercynian folds make a great S-shaped bend on the eastern edge of the Archæan block, with a pronounced change of direction at the eastern end of the present Sierra de Guadarrama. Large segments of this old double arc are concealed under the Tertiary deposits of the Central Meseta, so that certainty in the matter is difficult to obtain, and though Staub's hypothesis is very attractive, it is not accepted by most of the Spanish geologists nor by Stille.

From the close of the Palæozoic onwards the region experienced a tranquil period during which even the great Hercynian mountains were worn down to their roots, and widespread deposits of Mesozoic and Tertiary material were spread out upon the old surfaces, though the north-western corner of the peninsula has apparently been above water since Pre-Cambrian times.

In spite of these early paroxysms the main lines of the present-day relief are due almost entirely to the mountain-building epoch which began at the close of Mesozoic times. At this period earth movements buckled the floor of the old "Mediterranean" Sea or "Tethys" into the true Alpine folds of the Betic Cordillera, which stretch from Cadiz to Cape de la Nao, and they also buckled up large parts of the more consolidated rocks of the "Euro-

pean " foreland to the north. The Pyrenees, the Basque Mountains, and the Cantabrian Mountains were formed at this time, though these areas had already undergone folding in Hercynian times. The Iberian Mountains and Catalanian Mountains are also attributed to the Tertiary era, and even the Central Sierras, the Toledo Mountains, and the Sierra Morena were in part a response to these later thrusts. Equally important is the fact that the whole of the old land-mass underwent epeirogenic, or vertical, elevation, though owing to the differential character of the vertical movement some segments of the mass were raised higher than others. Naturally the amount of folding or deformation that took place depended on the plasticity of the material involved, and as the ranges of the Meseta were re-formed out of tough old material, faulting rather than folding was responsible for the elevation of the Central Sierras, the Montes de Toledo, and the Sierra Morena. On the other hand, the Pyrenees, the Iberian Mountains, and the Catalanian Mountains included much Mesozoic material previously unfolded, though both systems incorporated portions of the old massif. Apart from the Pyrenees, none of these chains show the *nappes* or *decken* typical of the true Alpine folds, and even in the Pyrenees these are not well developed, so that fundamentally the mass of Iberia belongs to Hercynian Europe and is allied structurally to the central massif of France, the Bohemian massif, etc. This contrasts with the Betic Cordillera where full development of *nappes* has taken place, and which may therefore be compared with the Alps and the Apennines as belonging to the Alpides, i.e. the young folded mountain zone of Eurasia.

Climate and Vegetation.—A division of Iberia into two rainfall regions, pluviose and arid, is in some ways more helpful than that between a Mediterranean and a north-west European type of climate. The pluviose region, with over 600 mm or 24 inches of rain, includes the western, northern, and north-eastern margins of the peninsula, i.e. most of Portugal, all Galicia, the Cantabrian and Basque region, the Pyrenees, and the Catalanian Mountains. The area which may be said to have a north-west European type of climate is rather more restricted, since it includes only the northern margins of Spain and Portugal as far as the River Douro, and the western and central Pyrenees.

The Biscayan coast-lands and northern Portugal are marked off from the rest of the peninsula by having their rainfall well distributed throughout the year and no dry season. Summer temperatures are rather lower than in the Mediterranean sections, but the warm dampness of the lowland and valleys is more oppressive than the drier heat of the Mediterranean. Fortunately the large amount of mountainous country gives bracing air, and the



FIG 21—STEPPE AND IRRIGATED LANDS OF SPAIN.

region may be said to combine the advantages of both the north-west European and the Mediterranean types of climate from the point of view of plant life, as in the similar climate of the basin of Aquitaine in France. The rainfall is both heavy and constant enough for good cattle pasture and forest, and though the summers are not quite hot enough for the olive they are long enough for the vine, while the characteristic fruits of central and western Europe also flourish, and both maize and wheat can be grown. The diversity of produce is obviously great.

All the rest of the peninsula can be classified as Mediterranean in climate, though the modifications on the Meseta and in the Ebro basin are great. There is an abrupt change on the southern side of the Cantabrian Mountains from a humid climate with small daily ranges of temperature to an arid climate with marked contrasts between day and night temperatures. The Meseta generally has scanty rain, clear skies, hot dusty summer days, cold sunny winter days, and a marked drop of temperature at sunset at all seasons. The resultant vegetation is a sparse covering of bush or of dry tufted grasses, except in favoured areas, such as the better-watered valleys. The Central Sierras were originally forested, probably never very densely, but have been largely denuded by man, and both the climate and the cropping by sheep and goats are adverse to renewal. The northern portion of the Meseta is at a higher level than the southern portion, and consequently has lower temperatures, but there is no essential difference between the climate of the two sections. It is true that the olive will hardly grow north of the Central Sierras and can be grown in favoured spots on the Meseta south of them, but it is not widely grown on the Meseta at all. Drought-resisting plants such as wheat and barley will grow where the soil is sufficiently retentive of moisture, and there is a diversity of crops where the water table is sufficiently high to be reached by the roots of plants, as in the valleys. Elsewhere the region is given up to pasturing sheep and goats. The Ebro depression is similar, but has wide areas under irrigation.

The Catalanian Mountains resemble central Italy in climate and crops, but south of the Ebro the Mediterranean coast-lands are drier than southern Italy, and especially in Murcia very little will grow without irrigation. The Andalusian depression may be placed in the latter division, since it shares in the high winter temperatures, though the rainfall is rather greater than on the Murcian coast. (*See statistics on p. 80.*)

The Portuguese lands south of the Douro have a heavier rainfall than the interior, greater atmospheric humidity, and higher winter temperatures. The climate favours a rather profuse development of the Mediterranean vegetation, and there is even enough rainfall for maize, which is not a typical Mediterranean plant owing to the large quantities of water it demands.

Station.	Latitude	Temperature in degrees Fahrenheit		Annual rainfall in inches
		Jan	July	
Bilbao .	43° 20'	46	70	46} Biscayan type
Santiago .	42° 53'	46	66	65} S Portuguese type
Lisbon .	38° 42'	49	70	29} Andalusian and
Seville .	37° 23'	52	85	19} Valencian type
Murcia .	37° 59'	50	79	15} Catalonian type
Barcelona.	41° 23'	47	74	21} Meseta type
Burgos	42° 20'	35	64	22} Ebro basin sub
Madrid	40° 24'	40	77	17} type
Zaragoza .	41° 38'	41	76	12

MEAN RAINFALL IN INCHES

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Santiago	7.8	6.4	6.7	5.3	5.2	2.5	2.0	2.4	5.2	6.7	7.3	7.6	65.1
Lisbon .	3.7	3.3	3.8	2.8	2.1	0.5	0.2	0.3	1.3	3.0	3.7	4.0	28.7
Seville	2.1	1.9	2.5	1.9	1.7	0.6	0.0	0.2	0.7	1.9	2.4	2.7	18.6
Murcia	1.2	1.1	1.3	1.6	1.5	0.7	0.3	0.2	1.9	1.9	1.5	1.9	15.1
Barcelona	1.4	1.5	1.8	1.9	1.7	1.5	1.0	1.3	3.0	3.1	1.8	1.4	21.4
Madrid	1.3	1.3	1.6	1.6	1.7	1.3	0.4	0.5	1.5	1.8	2.0	1.6	16.6

The Heart of the Peninsula, the Meseta.—The term Meseta will here be used in its geographical sense to indicate the high tablelands of central Iberia, and not in the manner of many geologists who use the term to cover the whole of the so-called Archæan and Hercynian "block," regardless of relief.

The Central Sierras divide the Meseta into two sub-sections, that to the north lying in the old provinces of Old Castile (Span., Castilla la Vieja) and Leon, and that to the south in New Castile (Span., Castilla la Nueva) and Estremadura. These plateau basins are mainly surrounded by higher and more rugged country, and their floors of old rocks are to a large extent masked by widespread deposits of Tertiary and later material. There are wide stretches of almost level plateau in both sub-regions, but the two great basins must not be considered as devoid of relief. For instance, in Extremadura the ancient rocks have only intermittent patches of Tertiary material overlying them, and the surface is rather rugged, since erosion on the different bands of old rock has tended to produce a ribbed effect parallel to the strike, which is here mainly north-west to south-east. Also, the land round the rim

of the basins is usually well dissected by tributaries coming from the surrounding heights.

North of the Central Sierras on the monotonous, generally treeless, expanses of plateau which are developed on the Tertiary and later deposits, cereals such as wheat and barley can be grown where a suitable clayey or marly soil occurs, as in the Tierra de Campos west of Palencia and the Tierra del Pan north of Zamora. On the limestones and coarse gravels, particularly of the northern rim, sheep pastures are more usual than corn-lands.



[Photo F. Pacheco]

FIG 22 —THE TIERRA DE CAMPOS, ON THE PROVINCIAL BOUNDARY
BETWEEN VALLADOLID AND PALENCIA

View taken in spring. Note the absence of trees and the flatness of the plateau.

Population is scanty everywhere, even the "big" towns being quite small. Valladolid, the centre of the region, has a population of 98,000,¹ but Salamanca, once world-renowned for its university, has only 54,000, and the gap town of Burgos only 43,000.

The Central Sierras usually rise gradually from the northern Meseta and drop abruptly on the southern side. These mountains, consisting largely of granite and crystalline schists, reach a height of 8,731 feet in the Sierra de Gredos, carry snow in winter, and were sufficiently high for the highest summits to carry glaciers and to be

¹ Population figures are estimates for 1934.

carved by cirques in the Quaternary Ice Age. As a rule, however, the pre-existing peneplane character is still sufficiently retained to give plateau-like and rounded forms. There are a few fragments of the old pine and oak forests remaining, but generally the mountains are bare apart from scrubby pasturage. Transhumant sheep and goats are driven up for the summer from the surrounding plateau, and human beings also take refuge in the cooler mountain air from the summer heat of Madrid.



[Photo F. Pacusco]

FIG 23 —THE CABEZAS DE HIERRO (8,157 FT.), A GNEISSIC MASSIF
IN THE SIERRA DE GUADARRAMA

View taken in June from the foot of Peñalara

In spite of their height the Central Sierras are not a great barrier to communications, as there are many passes, largely connected with the many geological faults.

The Southern Meseta.—Here there are two contrasted regions, the Tertiary sediments of level relief and monotonous aspect in New Castile, and the more rugged and somewhat better-watered country to the west in Estramadura where the old rocks appear on the surface.

In New Castile the clays of the central portion, known as La Mancha, have an indeterminate drainage, and the evaporation of expanses of surface water has led to the

development of widespread saline deposits in which only salt-loving vegetation flourishes. Since La Mancha is mainly surrounded by higher lands its rainfall is scanty, and steppe, mainly growing esparto grass in widely spaced tufts, is the prevailing vegetation. It has also been suggested that the saltiness of the soil was partly caused by the presence of salt in the Tertiary deposits, and that owing to the dry climate the salt has been preserved here, whereas in areas of greater rainfall it has been either washed out of the soil or the salt-impregnated



[Photo F Pacheco

FIG 24—THE LLANURA, OR GREAT PLAIN, OF LA MANCHA

View near Puebla de Almoradiel, province of Ciudad-Real

deposits have been covered by later detritus. The salt steppes of La Mancha and those of the Caspian depression in Russia are the most striking examples of the "alkali" type of country which is little represented in Europe, but which is developed on so large a scale in western U.S.A., north Africa, central Australia, and central Asia. Sheep rearing is the historic industry, but some cereals, olives, and the vine are grown in favoured areas. The esparto industry supports many villages. The La Sagra region, north of the Tagus, near Toledo, is rather similar country to La Mancha. The eastern margin of the central Meseta, known as La Alcarria, is, however, quite different. It stands at a higher level, and its Tertiary limestones which

overlie the clays are much dissected by narrow valleys, and these are quite productive, though the limestone plateaus are remarkably arid and barren. La Alcarria is connected with the name of the Spanish hero Le Cid in his exploits against the Moors. The region is transitional to the Iberian Mountains

Estramadura is a region of greater variety of relief, soils and agriculture, and a somewhat greater rainfall. Its large areas of old, often impermeable rock, such as slates, quartzites, and granites, still carry a large number of



FIG 25—EVERGREEN OAKS AND PASTURE LAND IN THE VALLEY OF ALCUDIA, PROVINCE OF CIUDAD REAL

View taken in May Although much of New Castile is very poor land, the valleys are generally productive and have more trees than those of Old Castile.

rather stunted cork oaks, which were noted in classical times for supplying food to large herds of pigs. Much of the land presents the appearance of a heathy moorland, however, and only grazes sheep and goats, but there are favoured regions, such as the Tierra de Barros, south-east of Badajoz, where there is a considerable area covered with fertile Tertiary clays, and here cereals, vines, and olive are grown in abundance. In the depression of Badajoz, on the Guadiana, with possibilities for irrigation, there is a region of even richer agriculture.

Population is as sparse in both provinces as in Old Castile and Leon, and is similarly agglomerated into large

villages with a curiously town-like appearance, or into small towns, but, with the exception of Madrid, large towns and cities are lacking.

The position of Madrid has the advantage of being central and of being healthy, though other natural advantages are few. It was chosen as capital in 1561 in place of Toledo, and the system of roads, and afterwards that of railways, was centralised upon it. It is the seat of an administration which up to present times has been very highly centralised. It is also the chief centre in Spain of commerce, education, and art. With a population of 1,048,000 (in 1934) it is, however, smaller in size than Barcelona, whose growth was unaided by the artificial advantages bestowed on Madrid.

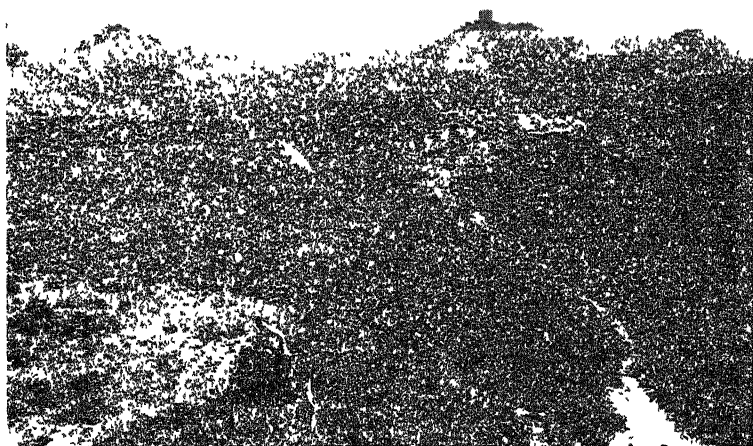
Badajoz, with 46,000, is the next largest centre of population in the southern Meseta. Toledo is now little more than a tourist centre and has only 26,000 inhabitants.

The Sierra Morena rises very gradually from the central Meseta and is only a little above the level of the high plateau. On the south, however, it sinks abruptly by means of a great fault to the Guadalquivir depression. It is particularly rich in minerals, especially copper and iron pyrites, which are mined to-day mainly in the Rio Tinto district; silver-lead, which is mined in the Linares district; and mercury, from the famous mines of Almaden. These deposits are largely associated with igneous intrusions. The small coal-fields, of Carboniferous age, south-west of Ciudad Real (Puertollano) and north-west of Córdoba (Belmez), have some importance in an area which otherwise is very deficient in fuel.

The Iberian Mountains.—These folded ranges rise only gradually from the Meseta on the west but drop rapidly to the Ebro depression. They run in a south-easterly direction from just south of Burgos nearly to the Mediterranean coast, where they overlook the plains of Valencia and Castellón. The ranges reach a height of 7,684 feet in the north and are about 100 miles wide on an average, and their height, width, and barren character makes them a formidable obstacle; in fact they formed the frontier between the old kingdoms of Castile and Aragon. There are two gaps, however, which allow movement between the Ebro depression and the Meseta. Between the Iberian Mountains and the Cantabrian Mountains is the transverse depression of Burgos filled with Tertiary material, while in the middle of the system is the gap

along the River Jalon. The Teruel depression allows communication between the middle of the Ebro depression and Valencia. All three are followed by rail.

The Ebro Depression.—The climate and natural landscape of the Ebro depression resemble closely those of the steppes of the central Meseta in spite of the much lower elevation. It is blessed, however, with large supplies of water, owing to the nearness of the Pyrenees, so that large areas are under irrigation. Nowhere else in Spain is a



[Photo F. Pacheco]

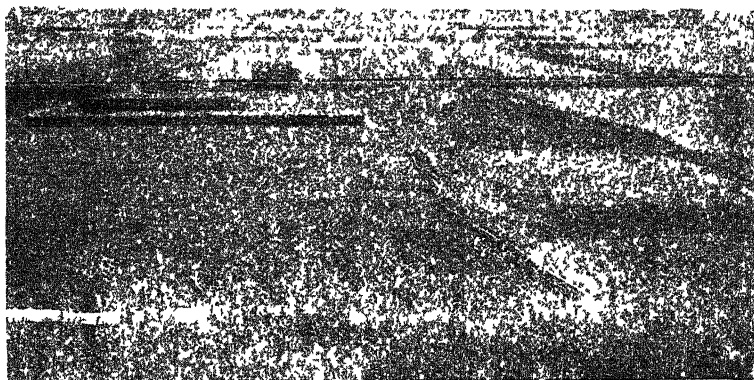
FIG. 26.—STEPPE LANDS ON THE SIERRA DE ALCUBIERRE (MIOCENE FORMATION) ON THE PROVINCIAL BORDER OF ZARAGOZA AND HUESCA

Similar barren and much dissected hills are to be found on various formations around the depression of the Ebro. (The hills along the Mediterranean coastlands from Cádiz to C. de la Nao, though higher, present a similar appearance.)

...ge arid region so close to mountains which have such a large volume of rain. It is not possible, however, to irrigate the whole of the Ebro depression, even if there were sufficient water available, for the region is not a continuous plain. The Tertiary deposits, consisting of practically horizontal layers of sandstones and marls, have been dissected by the rivers into a series of low, flat-topped plateaus, or where erosion has gone further, into *buttes* or *mesas*. The two main areas suitable for irrigation are, first, the lowlands along the Ebro below Tudela, where irrigation water for 92,500 acres is derived from two

main canals taken off from the Ebro itself, and secondly the lowlands round Lerida, where irrigation water is derived mainly from canals taken from the River Segre and River Esera, the latter a tributary of the River Cinca.

The irrigated lands round Lerida form the largest block of irrigation in the whole of the peninsula and consist of about 400,000 acres of irrigable land. They are the most recent of the great irrigation works, the Canal de Urgel dating from 1861, and the Canal de Aragón y Cataluña being finished in 1910. By means of a network of canals



[Photo F. Pacheco]

FIG. 27—THE ZARAGOZA HUERTA, NEAR THE JUNCTION OF THE
EBRO AND GALLEGO

View taken in spring. The business-like appearance of this irrigated area recalls the similar lands in the Plain of Lombardy.

the former steppes of the Llanos de Urgel have been transformed into highly productive land. Lerida itself has a population of 39,000. Zaragoza (189,000), the old capital of Aragon, now stands in the midst of irrigated lands obtaining water from the River Gallego as well as from the Ebro. It has a good nodal position in regard to (a) the Jalón route through the Iberian Mountains to the Meseta, (b) the trans-Pyrenean route *via* Jaca, both followed by railways, and (c) the route following the River Ebro.

The Ebro depression nowhere abuts on the coast, but is cut off from it by the Catalonian Mountains, through which the Ebro breaks in a rugged defile.

The Catalanian Hill-and-Mountain Country.—Apart from the plains round Lerida, which geographically belong to the region of the Ebro depression, Catalonia (Sp., *Cataluña*) is essentially a region of hills and valleys. The coastal plain is very narrow and interrupted by rocky headlands (*costa brava*) in the north-east, the only considerable coastal lowlands being in the Ebro delta. The region forms a great contrast not only to the central Meseta, but also to the Ebro depression, and in its climate, relief, vegetation, density of population, and active economic life closely resembles the northern parts of the Apennine peninsula. The mass of the region just comes within "pluviose" Spain, and the hillsides are covered with olives, vines, cork oaks, and similar Mediterranean vegetation. Irrigation is practised along the coast and in the lower valleys.

The region is predominantly agricultural, but also has an active commercial life, and possesses manufactures which, though not large compared with those of the industrial countries of Europe, are very important for Spain. The manufactures depend on imported coal and iron (though a considerable amount of hydro-electricity is also used), and mainly on imported raw materials, so that they are in a similar position to those of Italy, and have the similar advantages of cheap labour and a protected home market. Textiles (especially cotton), machinery, glass, and chemicals comprise the chief articles manufactured. These industries are centred mainly in and round Barcelona, and thus have also the advantage of ocean-borne transport for the bulky raw materials. Barcelona itself is the leading commercial and industrial city and the leading port of the whole of Spain, and with a population of 1,148,000 is the largest city of the country.

Catalonia has a strongly pronounced regional consciousness, probably the most highly developed in Spain and certainly the most vocal. This consciousness is anti-Castilian and is based on profound differences of environment and historical development between this bustling Mediterranean region and the aloof inland environment of Castile.

The Irrigated Mediterranean Coastlands.—From the Ebro delta south-westwards right round to the Straits of Gibraltar there extends a region of low rainfall and

high temperature where oases of irrigation culture are backed and sometimes encircled by barren mountains. This long, narrow region shows some variation from north to south, but there is everywhere an essential contrast between the densely peopled, highly productive irrigation areas and the surrounding almost valueless and deserted mountains.

In the north, from the Ebro delta to Cape de la Nao in Valencia, the irrigated districts ("huertas," from Lat. *hortus*=a garden) are practically continuous along the coast, and the hills which back the region are not so barren as in the drier region of Murcia farther south. Whereas, however, the unirrigated land has a population density similar to that of the central Meseta (*c.* 70 per square mile) the huerta of Valencia has a density of over 2,000 per square mile. The narrow mountain valleys of this region of Tertiary rejuvenation facilitate the construction of dams just above the points where the rivers debouch on to the plains, and the rivers, which rise in the lofty Montes Universales, afford adequate supplies of water to irrigate the restricted area of these lowlands.

As in most irrigated areas there is an extraordinary diversity of produce, but the chief cash crops, largely exported to England, are oranges, grapes, and almonds. Small quantities of rice are also cultivated, but the old cane sugar and silkworm industries are moribund. Valencia (353,000), the third city of Spain, is the centre of the region.

In Alicante and Murcia, the mountains, which here belong to the eastern section of the Betic Cordillera, run parallel with and close to the coast, and out to sea at Cape de la Nao. The irrigation areas, such as those round the towns of Lorca, Murcia, and Elche, are therefore mainly inland. The amount of water available is less than in Valencia, since the mountains are lower and more arid, and the supply is more difficult to control since the rainfall is both more seasonal and more torrential. The barrenness of the surrounding mountains amounts almost to desert conditions, and the steppes of New Castile are continued right across the intervening mountains to the gaunt ranges along the coast. The population figures of the numerous towns of considerable size bear witness to the productivity of the oases, *e.g.* Murcia (166,000), Cartagena (97,000), Alicante (78,000).

West of Cape de Gata, the lowland, and therefore the irrigable land, is very restricted, and there are only small huertas, *e.g.* round Almeria (56,000), Málaga (204,000). The mountains themselves are less desolate, having a more abundant rainfall—indeed, the western end of the Betic Cordillera may be said to form an outlying part of “pluviose” Spain—though still presenting an arid appearance to English eyes.

The Betic Cordillera.—This region overlaps the previous one, but whereas in the above paragraphs it was treated merely as a background and a supplier of water to the irrigated coastal lands, here it will be treated as a structural entity.

The Cordillera stretches from the Cadiz coast, where it sinks beneath the waves of the Atlantic, to Cape de la Nao, where it disappears beneath the Mediterranean waters, only to reappear again at intervals in the Balearic Islands. Its length on the mainland is about 360 miles. On its northern side it sinks to the Guadalquivir depression in the west, but farther east it abuts directly on to the Meseta. It consists of three main east-west zones. first, a narrow Flysch band along the north; secondly, a broad band of Mesozoic sediments, chiefly limestone; and thirdly, a band of Palæozoic sediments and crystalline material which begins on the south coast west of Málaga and continues eastwards.

The narrow Flysch zone and the Mesozoic zone both have a fair rainfall on their western, *i.e.* Atlantic, extremities, and at first carry remnants of former forest. They become much more barren as one goes eastwards and finally only carry steppe. In the Mesozoic zone, however, there are a number of tectonic depressions, and where these are at a sufficiently low level and not dissected by cañons they are able to draw on large supplies of water from the surrounding mountains, and in consequence are well cultivated and populated. The most important of these is the huerta of Granada, which has the advantage of lying between the Mesozoic and the crystalline zone and of obtaining large supplies of water from the lofty, crystalline Sierra Nevada. Even the unirrigated lands of the Granada basin have enough water for the olive and for such cereals as wheat and barley. Granada (125,000), the last stronghold of the Moors in Spain, is world renowned both for the natural beauty of its site and for the magnificent buildings erected by the Moors.

The Palæozoic zone is on the whole more fertile than the Mesozoic, since the predominating crystalline schists of the former are more fertile and less permeable than the predominating limestones of the latter. Consequently, behind Málaga, the coastal mountains are well terraced and cultivated and the same is true of the valley sides in the interior. Farther eastwards, however, there is the same decrease in rainfall and therefore in productivity as in the Mesozoic zone, and vegetation degenerates into steppe in the eastern part of the province of Andalusia and, as already mentioned, in Murcia.

The highest range of the Betic Cordillera is the Sierra Nevada, which reaches a height of 11,421 feet. It carries snow throughout the greater part of the year and a tiny patch or two usually remains throughout the summer. The ranges of the chain are separated from each other by depressions, often due to faulting, so that in spite of the length and breadth of the Cordillera it is fairly easily traversed and is moderately well served by railways.

The Guadalquivir Depression.—This lowland, also known as the Andalusian or Betic depression, is a tectonic depression covered with Tertiary and later deposits. It shares the high temperatures of the southern coasts, and in contrast to the Meseta possesses much good soil, but is not the rich and productive region it has often been fabled. On the contrary, it contains a good deal of unproductive steppe and its rainfall is usually only sufficient for olives and other drought-resisting crops such as wheat and barley, though in places it is sufficient for vines. Moreover, there is no extensive irrigation system as in the Mediterranean coastlands or in the Ebro depression, though the small patches that are watered from the Guadalquivir yield excellent results. To make matters worse the depression has been one of the strongholds of large estates (similar in size to those of the Meseta), with all the attendant evils of the "latifundia" system. The most important products of the depression are olive oil and wine, the wine of the Jerez region (sherry) being largely exported, while that from the foot of the Betic Cordillera (*e.g.* montilla) is famous at home.

The largest town of the region is Seville (Span., Sevilla; 239,000), situated at the head of navigation for large ocean-going steamers. Córdoba (118,000) is the only other town of any size in the interior, though there are many large villages. It stands at the point where the plain

begins to widen out westward, and is a meeting-place for routes through the Sierra Morena and Betic Cordillera. There is no port at the mouth of the Guadalquivir, owing to the marshes and unstable sand dunes, but Cádiz (75,000) to the south has an excellent and historic harbour and is backed by the best watered region of the plain. Huelva (50,000) on the northern edge of the plain is the port for the Río Tinto copper and pyrites mines of the Sierra Morena edge.



[Photo F Pacheco]

FIG 28—VIEW IN THE GUADALQUIVIR DEPRESSION

Calcareous hills near Mairena del Alcor, province of Seville. Note the village and castle on the ridge, the string of bullocks in the middle distance, and the prickly-pears and aloes in the foreground.

The Northern Coastlands of Spain.—These northern lands all possess a climate with abundant rain and equable temperatures, but show considerable differences in their relief and in their inhabitants. Three regions may be distinguished, the Basque lands on the east, the Asturias in the middle, and Galicia in the west.

The Basque hill country is composed of material of Mesozoic age, folded probably at the same time as the Pyrenees, and continuing in almost the same direction. The northern side is rainy, well cultivated, and thickly peopled, whereas the southern side partakes of the aridity of the Ebro depression. As in all the northern coastlands,

small holdings and a disseminated population are the rule, in contrast to the large holdings and aggregated dwellings of the mass of Spain. The rich iron deposits have led to the development of an iron industry in Bilbao (176,000), though the bulk of the ore is exported to the British Isles. The city of Bilbao, on the drowned estuary of the Nervion, is also an important banking and commercial centre. The people of this region, who share with the Catalonians a reputation for energy and enterprise, differ in many ways from the population of the rest of Spain. In particular their language marks them off as a people apart, since it does not belong to the Indo-European group, but is apparently descended from a very ancient group of languages, of which it forms the sole modern representative. Its use is diminishing in favour of Castilian, especially in the big towns of the region. The Basque hill country is easily traversed and forms the northern gateway from Spain into France.

The same type of country is continued westward into Old Castile, which here reaches the north coast, and the iron-exporting port of Santander (91,000) stands on a similar drowned estuary to that of the Nervion.

The Cantabrian Mountains of the *Asturias* rise to much greater heights, the Peñas de Europa reaching 8,668 feet. The high mountains were glaciated during the Great Ice Age and show "lofty summits lost in mist, toilsome passes, deep narrow valleys, gorges and ravines" (Dantín-Cereceda). It was behind these ranges, *i.e.* to the north of them, that the Castilian resistance was organised against the Moors.

On the north the Cantabrian Mountains drop down to an east-west depression filled with deposits of the Cretaceous period. This depression broadens out round Oviedo (78,000), and on the seaward side is a stretch of undulating or hilly country bordering the coast. "Here is the Asturias of the stories, the Asturias of light, free air, moderation, and balance. In the mild, humid, uniform climate Central European vegetation flourishes side by side with the Mediterranean fig, the Asiatic orange and lemon; the rosy apple blossom decks the garden walls" (Dantín-Cereceda).

The region is also rich in minerals, the chief coalfields of Spain lying in the Carboniferous strata of the northern side of the Cantabrian Mountains near Oviedo, while there are further deposits on the southern side of the ranges in Leon

On the border of Asturias and Galicia the strike of the Cantabrian Mountains curves round from east-west to north-south, and lofty mountain chains, running in the same direction as the strike, form a difficult barrier country between the two regions, so much so, that there is no direct railway connection between Galicia and Asturias.

Galicia is a dissected peneplane composed mainly of granite and crystalline schists. It has many features in common with the other two regions of Europe that end in a "Finisterre," namely, the south-western peninsula of England, and Brittany. Not only are all three dissected peneplanes, but they all have a *ria* coast with a fishing industry, an equable rainy climate, and an active dairying industry. All are fairly densely populated in spite of considerable areas of infertile granite, and all have suffered commercially from their peripheral position. The central depression of the Miño valley is more thickly peopled than the rest of the interior, but population is strongly attracted to the coast. As in Brittany, the sardine fishery is important, and as in the corresponding regions of England and France, there is an important naval station on a *ria*, here Ferrol (30,000). Vigo and Corunna (Span, Coruña; 80,000) are ports of call for liners on the South American route.

The Pyrenees.—The Pyrenees stretch for about 260 miles between the Mediterranean and the Bay of Biscay and attain a maximum width of about eighty miles. Like the Alps they contain an interior zone of hard crystalline rocks such as granites, gneisses, and crystalline schists which weather slowly, and outer bands of little altered sedimentary rocks, generally of Mesozoic and Tertiary age, in which limestones predominate. The higher peaks and the watershed lie nearer the northern than the southern side, so the northern or French slope is steep and narrow, but on the Spanish side the descent is more gradual. The Pic d'Aneto (11,169 feet) in the Maladetta group is the highest summit of the chain, and the central Pyrenees between the Col de la Perche and the Pic d'Anie maintain a great average height, never falling below 5,000 feet.

Unlike the Alps, the Pyrenees have no glaciers of any size, only one or two little plateau glaciers on the northern side of the highest peaks, but they were abundantly glaciated during the Ice Age and bear all the marks of

ice-work in the sharp arêtes, the U-shaped valleys, cirques, rock basins, and so on.

The western Pyrenees stretch from the Bay of Biscay to the Pic d'Anie, a distance of some fifty miles. They present considerable differences from the central Pyrenees, since the middle crystalline zone is here very narrow, and its place is largely taken by Permo-Triassic sandstones. South of this belt lies a band of early Tertiary material consisting of marls, chalk, and conglomerates, generally easily eroded and forming lower ground. In this zone on the River Arga stands Pamplona (33,000), the capital of Navarra. The whole region has rounded forms, instead of Alpine peaks, and is easily crossed, the best known pass being that of Roncesvalles (3,452 feet), which carries a motor road. The only railway skirts the mountains by following the coast. The rainfall is considerable even on the Spanish side, and some forest remains, though it has been much cleared to form arable land, as well as pasture. On the south-west the Pyrenees merge into the Basque hill country.

The central Pyrenees extend for a distance of some 150 miles. A broad central zone of crystalline schists of Palæozoic age, with numerous masses of granite, is succeeded southwards by a zone of Mesozoic rocks, containing much limestone. This is followed by a zone of early Tertiary rocks, including marls and conglomerates, which form a belt of lower land. Farther south, overlooking the Ebro basin, once again a zone of Mesozoic rocks forms mountainous country. The rivers coming from the high central ranges break through all three zones, but often have longitudinal tributaries coming in from the Tertiary zone. These longitudinal depressions are shorter, less deep, and less broad than those in the Alps and offer less suitable sites for human habitation. Occasionally, however, they broaden out, as along the upper reaches of the Aragon River, in whose valley was formed the nucleus of the kingdom of the same name. The central Pyrenees form a climatic divide, the French side having a heavy rainfall distributed throughout the year, while the Spanish side is dry and therefore much less productive. Little cultivation is carried on and the scanty population derives a livelihood mainly from sheep and goat-rearing. A beginning has been made, however, with the development of hydro-electricity. Two trans-Pyrenean railway lines have been recently constructed in

the central section, a western one, opened in 1928, following the old Somport pass and connecting Zaragoza with Pau, and an eastern one *via* the Puymorens tunnel, connecting Barcelona with Toulouse

The eastern Pyrenees stretch eastwards from the Col de la Perche for some sixty miles, but are very attenuated near the coast, where they break down except for the narrow Mts. Albères, which separate the tectonic basin of Roussillon on the French side from the similar but smaller basin of Ampurdan on the Spanish side. A railway follows the coast route.

Although less than half as long as the Alps, only about half as broad, and less high, the Pyrenees have always been considered more of an obstacle. The physical difficulties, however, have often been exaggerated, and the real reasons for the lack of early roads and railways are to be found in the position of the chain. In the first place it does not lie athwart any great world route, as do the Alps, and secondly the traffic that existed could circumvent the chain either by the coast routes at either end or by the sea routes. Once the demand for routes arose in modern times with the coming of the tourist "industry," hundreds of miles of roads suitable for motoring have been made, particularly on the French side, where the tourist industry is better organised, and, as already mentioned, two railways across the chain have also been constructed

Spain.—Economic summary.—In spite of its excellent position, its early entry into the civilised world, and its great trans-oceanic conquests in early modern times, Spain to-day is a backward country. One should not expect a dense population in this arid land, though the population density of 125 per square mile is rather surprisingly low. Nor should one expect great industrial development considering the small deposits of coal and the expense of working the rather difficult seams, but there are considerable amounts of iron-ore and water-power, and in comparison, say, with Italy little has been made of these opportunities. One might, however, reasonably expect that the staple industry of agriculture should be run on modern lines, but apart from certain limited areas, methods are still extremely primitive. With this may be connected the facts that only half the population can read and write and that large numbers are miserably poor. Also there is much unproductive land, some 10 per cent. of Spain

being entirely rocky and useless, about 35 per cent. being practically unproductive owing to high altitude, great dryness, or poverty of soil, and only 10 per cent. being really first-class land for agriculture.

The early part of the twentieth century saw the stirrings of new life in Spain and there was undoubtedly progress, particularly during and after the Great War, when Spain's neutrality was both profitable at the time and left her without the heavy debts and loss of man-power incurred by the belligerent states of Europe. The recent Civil War has, however, probably more than wiped out all the gains that had been made since 1914.

Many explanations have been put forward to account for the modern backwardness of Spain. The long wars against the Moors, who were of Moslem religion and of Arab and Berber origin, are said to account for the fanaticism developed in Spain, and this fanaticism led in turn to the expulsion not only of the Moors but also of the Jews, who formed the principal commercial class. The discovery of America and the exploitation of the minerals of the New World led to the neglect of the homeland. The domination of the whole country, and between 1580 and 1640 of the whole peninsula, by the central Meseta was also adverse to progress, since militant Castile, the chief champion against the Moors and therefore the most fanatical, was a poor country agriculturally and little interested in the furtherance of agriculture apart from sheep-rearing. Also Castile was remote from the sea and from other nations and little interested in commerce. The excellent central position of Castile and its good military organisation enabled it to dominate the more advanced parts of the country, such as Catalonia and the Basque provinces, and the marked differences between the various outlying regions of Spain led to a strong development of regionalism, which, though it was often anti-Castilian, also made it difficult for these regions to unite among themselves.

Agriculture is the chief occupation of the country, about 32 per cent. of the total area being under cultivation. The rest of the area is mainly either poor grazing land or totally barren, the area under forest being very small. The agricultural exports come principally from the irrigated lands of southern Spain, and consist chiefly of oranges, wine, grapes, olive oil, almonds, and other nuts. Cork and esparto grass, both natural products, are

exported to some extent. Curiously enough, the widespread sheep industry plays little part in the exports.

Spain has a great diversity of mineral wealth, including iron-ore, copper, lead, silver, zinc, mercury, and coal. In the output of iron-ore and copper it holds a high place among European countries, and owing to the undeveloped state of industrial life it has a surplus for export of iron-ore, copper, pyrites, quicksilver, and lead. The coal supply, however, is small, and considerable quantities are imported.

Large-scale industry is little developed, apart from the manufacture of textiles in and around Barcelona and the manufacture of iron and steel goods along the north coast. There is some export of textiles, particularly to the South American states.

The imports of the country consist chiefly of fuels (coal and oil), manufactured goods, timber, and raw cotton, but the total volume of trade is very low per head of population.

Portugal.—Portugal is in many ways more favoured by nature than any other section of the Iberian peninsula. Although the main structural lines of the western part of the Spanish Meseta are continued into Portugal, yet the land is generally at a lower altitude, with consequently higher temperatures. Also the country has the advantage of being to windward of the land-mass and of having a good supply of rain. Moreover, the Tertiary uplift of the peninsula brought to light here considerable Mesozoic deposits along the seaboard. In consequence, the country is naturally more productive than Spain and the population density is greater, though not as heavy as one might reasonably expect, being only 186 per square mile.

Portugal can be divided into three structural regions : (i) the old crystalline rocks of the Archæan mass to the north ; (ii) the level or lightly folded Secondary and Tertiary rocks of the middle ; and (iii) the old Hercynian folds south of Cape Sines and to the east of the middle zone along the Spanish border.

From the Galician border to rather south of the Douro mouth on the coast, and farther south inland, the first of these regions continues the granites and crystalline schists of north-western Spain. Here the old peneplane is much dissected and a number of east-west flowing rivers flow in deep valleys separated from each other by barren mountains. The moist, steamy, productive valleys concentrate the population, but communication between them, across

the intervening mountains, is almost impossible owing to the lack even of mule-tracks, and even along the valleys there is often no road for wheeled vehicles. The main exception to this aloofness and economic self-sufficiency is the Douro valley, with its town of Oporto (Port., Porto ; 232,000) and its celebrated port wine industry.

The Foreland of central Portugal is a diverse country of hills and lowlands. It is separated from the Meseta by a great fault which runs from north to south, from just south of the Douro mouth to the Tagus at Abrantes, passing just east of Coimbra. Farther south its existence is masked by Tertiary deposits, but it reappears again just east of Cape Sines. Even this Foreland was not immune from the earth swells connected with the Alpides movements, and the line of the Sierra de la Estrella is continued towards the south-west in the hills which run parallel to the River Tagus (Port., Tejo) on its northern side and end in Cape da Roca. This line of hills may be looked upon as a climatic divide, the land to the south having a drier and more purely Mediterranean climate than that to the north.

The Tagus separates the northern well-populated part of the Foreland from the infertile dry southern portion, which is mainly given up to heath only suited to sheep pastures and has a low population density. The lower Tagus valley itself is broad and productive, especially of wine, and so also are the lands east of Cape da Roca and Cape Espichel. The splendid harbour afforded by the lake-like widening of the River Tagus just east of its bottle-neck estuary, together with its central position, has helped the growth of Lisbon (Port., Lisboa ; 594,000), which is twice the size of the next largest town of Portugal. The coastlands of central Portugal are generally flat and dune-edged, so that the absence of any other good harbour concentrates trade upon the Tagus. In the heyday of the Portuguese overseas expansion Lisbon was a great slave market and a trading place of great international importance.

In spite of the absence of good harbours there is an active sardine-fishing industry along the coast, centred at Setubal, which, although it has only 37,000 inhabitants, is the third largest town of the country.

The southern section of Portugal consists of Palæozoic deposits folded in Hercynian times, but is no higher than the central part of the Foreland. Like the parts of Spain in the same latitude, it suffers from drought.

Its chief product is cork from the cork-oaks, which are also plentiful on the old rocks east of the Foreland.

On the whole Portugal must be looked upon as a backward country, only in the last few years having roused itself from economic and intellectual lethargy. Only about 36 per cent of the land is cultivated, communications are poor, the apparently considerable mineral wealth is neglected, and there are few manufactures. The exports consist chiefly of wine, fish (sardines mainly), cork, timber, and southern fruits, the imports of wheat, machinery, dried fish (mainly cod), cotton and cotton goods, coal and petroleum.

REFERENCES

There is no text-book of regional geography on Spain or Portugal in English.

L. Martin Echeverría's *Geografía de España*, in three small volumes (Barcelona, 1928), is very useful and is well illustrated with maps, photographs, and diagrams. T. Fischer's "Die Iberische Halbinsel" (in A. Kirchoff's *Länderkunde von Europa*, II, 2, Leipzig, Prague, 1893) also contains full descriptions. Three articles on "The Natural Regions of Spain," by J. Dantin-Cereceda, appeared in *The Geographical Teacher* (1922 and 1923). They are abstracts from *Regiones Naturales de España* (2 vols., Madrid, 1922) by the same author.

Tome VII (Part 1) of the *Géographie Universelle* series, *La Méditerranée Généralités, Espagne, Portugal*, by M. Sorre (Paris, 1934), deals at considerable length with these countries.

Portugal, by Dr. H. Lautensach (Gotha, 1932), is also recommended.

On structure R. Douvillé's "La péninsule ibérique" (in *Handbuch der regionalen Geologie*, III, 3, Heidelberg, 1911) is useful, but is somewhat out of date. A most interesting recent paper on the structure is R. Staub's "Gedanken zur Tektonik Spaniens" (in *Vierteljahrsschrift d. Naturforschenden-Gesell.*, Zurich, vol. 71, 1926).

J. Brunhes' *L'Irrigation dans la Péninsule Ibérique et dans l'Afrique du Nord* (Paris, 1902) gives a very full account but is rather out of date.

There is no complete topographic map of Spain giving contours, but there are a few sheets of an official map on a scale of 1 : 50,000, and a few sheets by the Servei Geogràfic de Catalunya on a scale of 1 : 100,000.

CHAPTER VIII

THE GREEK PENINSULA AND ISLANDS

THE total area of Greece amounts to only 50,000 square miles, but this small area of land is spread over a large range of latitude and longitude owing to the manner in which it is interpenetrated and surrounded by the sea. From the northern boundary in Macedonia (about $41\frac{1}{2}^{\circ}$ N.) to the southern coasts of Crete (about 35° N.) is a distance of some 450 miles, or as far as from Dover to Inverness, while from the west coast of Corfu (c. $19\frac{1}{2}^{\circ}$ E.) to the east coast of Samos (c. 27° E.) is an almost equal distance.

The region dealt with in this section excludes Macedonia, which, on the grounds that it is continental in climate and structure, is placed in the section on South-Central Europe. The remaining Greek lands, *i.e.* the peninsula and islands, may be looked upon as a half-drowned mountainous area with little except the tops of the mountains standing above sea-level. This sinking is more apparent in the east than on the west, which is higher and less penetrated by the sea and partakes of the inaccessible nature of the rest of the Dinaric coastlands. It is true that there are a number of tectonic basins, particularly in the east of the peninsula, and these may be compared with the similar basins of the Morava-Vardar corridor, but for the most part these plains are tiny, and hillsides play an important part in the rural economy. The area under the plough is consequently small, and the cultivation of fruit trees and of the vine is more important, since both will grow on sloping, stony ground, though the vine needs more water than the olive and succeeds better in terraces where the soil is deeper.

From the time of classical antiquity the Greek lands have habitually suffered from a shortage of cereals and have had to import these from over the sea. Only about one-fifth of the total area can be cultivated owing to the mountainous relief, consequently the region is agriculturally poor, and the resources of the inhabitants have been supplemented from the dawn of history by utilising the surrounding sea. As the Mediterranean Sea is rather

poor in fish, this activity mainly took the form of a carrying trade, together with the marketing of the goods carried. In addition, the ancient Greeks, particularly the Athenians, whose tillable land was exceedingly small, exported manufactured articles as well as olive oil and wine in exchange for cereals. In the world of to-day, however, when ships and other machinery are built of iron and driven by coal or oil power, the absence of these raw materials severely handicaps the Greek carrying trade and militates against the establishment of manufactures. While Greeks are now to be found in almost every country in the world pursuing their ancient trade of merchants and shopkeepers, those Greeks who remain in their own land derive their living chiefly from agriculture, with the addition of fishing for those who live along the extensive coasts.

Greece must now be looked upon as one of the poorest countries of Europe. The long stagnant years under Turkish rule emphasised the poverty of natural resources and left the country in a very backward state, the conditions of living, especially in the islands, being extraordinarily primitive; for instance, even wheelbarrows were unknown on Mytilini until a year or two ago, when they were introduced by an archæological expedition. The recent immigrants from Asia Minor who have been settled in the neglected basins of Macedonia, Thrace, and Thessaly may be expected to add considerably to the wealth of the country. The tourist traffic is also a source of wealth and is capable of considerable development: the glamour of a glorious past, together with the singular beauty of the Greek coastlands and islands, already attracts many visitors, whose numbers might be expected to increase still more if cleanliness and safety could be guaranteed all over the country.

Structural Outlines.—The Greek lands continue the main structural lines of the country farther north (*see* Fig. 3 and Chapter XXVI). The Dinaric system on the west extends through Epirus southwards to the peninsulas of the Peloponnesus, with the single transverse break of the Gulf of Corinth. The direction of the strike, which is followed by that of the mountain chains, is mainly north-west to south-east. The Pelagonian massif extends on the east as far south as Mount Pelion on the mainland and a similar massif appears at the south-east end of Attica and in the Cyclades, though here it is much dissected.

The rest of the islands mainly belong to the system of young folded mountains, with occasional young volcanic material. In Crete the direction of the folds has obviously changed to an east-west direction, and in Rhodes (Italian) to south-west to north-east. The various formations of the Dinaric system are so crowded together in Greece that there is a very great diversity of rock, a diversity which can be easily seen owing to the general scanty covering of soil and vegetation.

Geographical Regions.—The Greek peninsula may be divided into two main geographical regions, (*a*) the northern section (now centrally placed in the Hellenic Republic), which is scarcely Mediterranean in climate and has many points of resemblance to Macedonia and southern Albania, and (*b*) the rest of the peninsula, which is wholly Mediterranean in climate and outlook. The distinction made itself felt in the days of classical antiquity, for the greater part of the mountainous region between the Gulf of Corinth and the Albanian frontier lay outside the city states of ancient Greece and was regarded as semi-barbaric. Both these regions require some subdivision on grounds of relief, as indicated below.

Northern Peninsular Greece (Epirus, Pindus, Thessaly.)
—Only the coastal strips of this region allow of Mediterranean agriculture, since the central parts are sufficiently high to give rise to low temperatures, particularly in winter, while the low-lying eastern basins are cut off from sea influences by the coastal mountains bordering the Ægean Sea.

The limestone mountains of Epirus (mod. Greek, Epeiros) rise steeply from the concordant coast of the Adriatic and many reach a height of over 7,000 feet, while those of Pindus rise still higher to nearly 9,000 feet. Epirus, however, contains occasional fertile valleys and flysch-filled depressions (*e.g.* that round Yannina), whereas Pindus is a compact mountainous region very difficult to traverse. These mountains receive the heaviest rainfall of Greece owing to their height and relatively northern latitude (*c.* 39° N.), and though Mediterranean vegetation extends to a height of some 1,000 feet, above that level the winter cold is too great. Yannina (Gk., Ioannina), chief town of Epirus, at a height of 1,600 feet, has a mean January temperature of 41° F. and a mean minimum temperature of only 17° F. Above the Mediterranean vegetation come deciduous trees such as the sweet

chestnut and beech and also conifers, though the timber has been largely cleared for cultivation and pasture. Patches of cultivation extend up to nearly 5,000 feet. South of Epirus comes a similar region of parallel limestone and Flysch zones, though with a rather higher proportion of tillable land. The discontinuous coastal lowlands along the Ionian Sea are swampy and malarial, *e.g.* the deltaic land north of the Gulf of Arta and the delta of the River Aspropotamo. To the south this region is cut across abruptly by the fault lines bounding the Gulf of Corinth.

The Pindus zone cuts this region off from land communication with eastern Greece, though transhumant shepherds of both Greek and Vlach speech pasture their flocks here in summer, having come up from their winter quarters in the basins of Thessaly.

There are no railways in north-western Greece except the thirty-mile-long track running inland from the Gulf of Corinth to the fertile basin of Ætolia, and other means of communication are very primitive.

The Thessalian basins are girdled by mountains even on the seaward side, where the mountains of the Pelagonian massif are here mainly composed of crystalline schists and limestones. The most imposing of these mountains is Olympus, the mythical home of the gods, which raises its snow-capped head mightily above sea and plain to a height of 9,574 feet. Separated from Mount Olympus by the Vale of Tempe, which was formed by the River Peneus (Gk., Peneios), lies Ossa (6,409 feet), with its satellite Pelion (5,308 feet) to the south. The Vale of Tempe is traversed by the railway from Athens to Salonika, which was only constructed after the Balkan Wars (1911-13), previous to which there was no rail communication between Greece and the rest of Europe.

The basins of Thessaly contain the largest area of level land in Greece apart from Macedonia, but they are sparsely inhabited. The winters are cold and the rainfall low owing to the exclusion of sea influences by the surrounding mountains, and although with large-scale farming under Turkish overlords they were at one time quite important grain-producing regions, their treeless, steppe-like expanses are not adapted either in climate or relief to Greek horticulture. With assistance from the League of Nations the new settlers from Asia Minor, who are more accustomed to agriculture as distinct from

horticulture, are bringing about a transformation of these basins, which grow good grain and tobacco. Two small towns, Trikkala (19,000)¹ and Larissa (24,000), are respectively the markets for the two basins, and where the Gulf of Volos makes the only gap in the south-eastern rim of the basin of Larissa there occurs the only harbour and the largest town of Thessaly, Volos (40,000).

It will be seen that central Greece has little of the Mediterranean type of agriculture and even less of the sea life that characterises the southern part of the peninsula and the islands.

The Southern Part of the Peninsula and the Islands.—

This may be looked upon as classical Greece *par excellence*. The climate is purely Mediterranean, the summers are hot and very dry, the winters mild and rainy.

	Mean temperature.		Rainfall. Per cent of total falling in June, July, August.
	January.	July.	
Corfu . .	50° F	78° F	4
Athens . .	48° F.	80° F.	8

Even on the higher ground, where winter temperatures are lower, summer temperatures remain fairly high and drought prevails, *e.g.* Tripolitza at a height of about 2,000 feet has a January temperature of 40° F., but a July temperature of 73° F.

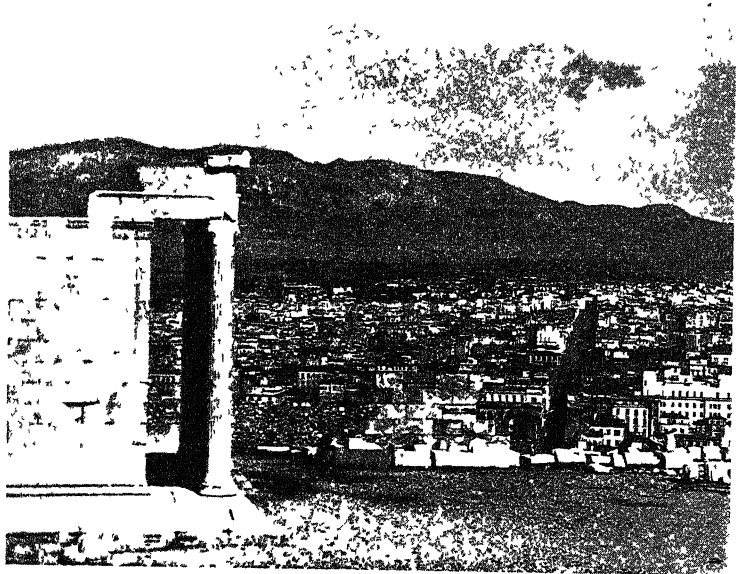
The differences in relief call for a subdivision into (a) the region centred on Attica, (b) the Morea or Peloponnesus, and (c) the islands.

The first of these regions is characterised by a large number of small basins, mainly tectonic, and by discontinuous heights, which, however, can be fairly easily circumvented so as to allow of communication between one basin and the next.

The typical Greek landscape of Attica and the Peloponnesus consists of a small tillable plain above which rise arid foot-hills with a scanty cover of scrubby maquis. These foot-hills rise in turn to towering mountains, whose bare bones show through the scanty vegetation, and like the foot-hills afford pasture only for sheep and goats. It is worth noting that even on the heights there are few tall

¹ Population figures are from 1928 Census.

trees, although these heights include many mountains sufficiently high to carry a winter snow-cap. Such are the western peaks of Vardussia, Giona, and the celebrated Parnassus with its ancient Delphic oracle. All these are over 8,000 feet, while Helicon farther east rises to a height of nearly 6,000 feet from the waters of the Corinthian gulf, and Hymettus and Pentelikon raise their heads high above the Athenian plain. The close juxtaposition of mountain, sea, and plain is a characteristic feature of the



[Nomlas Photo]

FIG 29.—VIEW OVER PART OF ATHENS FROM THE ACROPOLIS

Note the flatness of the little plain and the abrupt rise to barren mountains. The building in the foreground is the Erechtheum.

landscape of classical Greece and forms one of its main charms.

The general strike of the rocks in the region centred on Attica is from west-north-west to east-south-east, and differs slightly, therefore, from the north-west to south-east direction farther north and west. The interior is generally much more open to sea influences than in Thessaly, and the Mediterranean climate predominates, though even here the vegetation inclines to steppe in the northern basins. The most northerly basin, that of Lamia, through which flows the River Spercheios, is in fact rather similar to

Thessaly. A southerly row of basins traversed by the River Cephissos formed the ancient lands of Doris, Phokis, and Bœotia, with Thebes (now a tiny town of only about 7,000 people) as the chief town of the latter. By the drainage of Lake Copais, into which the River Cephissos flowed, an area of 50,000 acres has been acquired for agriculture. These basins are traversed by the Athens-Salonika railway, with an eastward branch to Chalcis (17,000) on the narrow seventy-foot channel which separates the island of Eubœa (Gk., Εὐβοία) from the mainland. The Eubœa contains mountains reaching 6,000 feet in the middle of the island, but the foot-hills of young Tertiary material are moderately fertile and well cultivated. The peninsula of Attica has the advantage of being centrally placed with regard to the three most productive parts of old Greece, (a) the Cephissos basins and the Eubœa, (b) the Peloponnesus, and (c) the Cyclades Islands. In itself it is not very fertile and suffers severely from drought. The total average rainfall at Athens is only 15 inches a year and much less falls in some years. At the present day, as in the past, Athens (Gk., Athenai) derives its importance from being the centre of Greek intellectual life and of Greek trade. In ancient times Corinth was equally well placed for trade, but has lapsed into obscurity, partly owing to the liability of the site to earthquakes, and partly because it lacked the ancient prestige which caused Athens to be chosen as the capital of an independent Greece at the close of the Wars of Liberation (1821-29). Athens, with its seaport the Piræus (Gk., Peiraios) which adjoins it, has a population of over 800,000, including suburbs: Athens, 453,000; Piræus, 254,000. Both are in process of transformation to modern cities along western European lines with the aid of various foreign companies. For instance, the gas supply is in the hands of a French firm, an American company is proceeding with the distribution of water, having built a great dam at Marathon, and an English company supplies the electric light. The Piræus with its suburbs is the main seat of manufactures and commerce in the country and contains shipyards, iron foundries, tobacco, silk, and soap factories.

The Peloponnesus, or Morea.—Since the construction of the Corinth Ship Canal in 1893 this peninsula composed of peninsulas may perhaps be looked upon as an island. Although mainly mountainous it contains a relatively

important coastal plain on the north and north-west coasts, and three quite fair-sized plains (for Greece) continuing the lines of the three southern gulfs. Of these plains Messenia in the west has the greatest rainfall and the densest population and is the only one growing oranges in considerable quantities. The plain of Laconia along the River Eurotas is the longest, being about thirty miles in length, but is only a few miles wide. Its northern interior part is very dry and the plain of ancient Sparta



FIG 30—AN ARCADIAN VALLEY WITH THE SLOPES TERRACED FOR VINES

In the western portion of the Peloponnesus the rainfall is considerable and the mountains less barren than is usually the case in Greece

is now a thickly planted orchard of olive trees. The plain of Argos is engaged at the present day in the production of green vegetables for the Athens-Piræus market, the necessary irrigation water for this arid plain being obtained from wells. Even the central highlands are interrupted by tectonic basins, *e.g.* those of Tripolitza and Megalopolis, both traversed by the railway from Corinth *via* the plain of Argos to the Messenian basin and coast. Also there is some useful cultivated hill country, especially in the north-west in Elis. The Peloponnesus is noted at the present

day mainly for the growing of a particular kind of small grape, which are dried and sold as currants, and which take their name from the town of Corinth. These grapes are grown on the wetter side of the peninsula, chiefly on the narrow coastal plains of the north and west and in Messenia, and the currants are exported principally from Patras (Gk., Patrai or Patra, 62,000), the most important port on the west coast. The population in the western Peloponnesus is denser than in any other part of the Greek



[Nomias Photo.]

FIG. 31.—THE LAND-LOCKED HARBOUR OF ITHACA.

The foreground is terraced for various cultivations, and planted somewhat sporadically with olive trees. Note, however, the barren promontory in the middle distance

mainland, apart from Attica, and reaches about 120 per square mile.

The Islands.—*The Ionian Islands*—The chief of these are Corfu (Gk., Kerkyra), Leukas (Gk., Levkas), Cephalonia (Gk., Kephallenia), Ithaca, Zante (Gk., Zakythos). They are composed of the same limestone and Flysch zones as Epirus, with some young Tertiary material, and the relief generally consists of low hill country, although Cephalonia and Zante have mountainous areas. The westerly position favours a plentiful supply of rain, Corfu having an annual average of 52 inches, and in addition to good

rainfall and soil the islands had the advantage of a long period of peace under Italian and later under British rule which terminated only in 1863, all three factors favouring the growth of a dense population, Corfu having about 280 people per square mile. The islands are well cultivated, Zante and Cephalonia being noted for their currants.

The Cyclades consist of very diverse material, but mainly of ancient rocks, such as granite, gneiss, marble, and crystalline schists, which contain a considerable variety of minerals. Milo and Santorin are, on the contrary, composed of young volcanic material, and the south-eastern islands of limestone and Flysch. The interior plateaus and mountains are mainly unproductive, while cultivation is laboriously intensive on terraces and on the tiny plains. Generally speaking the smaller islands of Greece are the domain of the peasant proprietor, are very densely populated, and show no increase in population owing to emigration.

The Cretan Arc.—Crete (Gk., Krete) with an area of 3,000 square miles is by far the largest of the Ægean islands. Its limestone core forms three main mountain masses, which lie nearer the south than the north coast, and which cause the steep harbourless south coast to contrast with the more gentle northward slope, whose fertile and well-cultivated foot-hills sink seawards to convenient bays. Two cities, Candia (Gk., Iraklion; 33,000) and Canea (Gk., Khania; 27,000), lie on this favourable coast. The island was in turn under Saracen, Venetian, and Turkish rule, but retained a predominantly Greek population and became part of Greece in 1913.

Rhodes (Italian) (It., Rodi) is the second largest island of the Cretan arc. Here the strike has assumed a south-west to north-east direction, but the young Tertiary rocks of which it is chiefly composed are infertile gravels, instead of the fertile soils which characterise the northern slopes of Crete. Limestone mountains rise above these hills. The population is mainly Greek-speaking.

The Islands of the Eastern Ægean.—These large islands are detached portions of the western peninsulas of Asia Minor. Samos consists partly of crystalline schists and limestone and partly of fertile young Tertiary hills and plains. The population reaches the surprisingly high figure of 230 per square mile and is therefore as high as that of the Ionian Islands. Chios consists mainly of

Palæozoic shales and mountain limestone, which are both infertile, and only in the south-east is there a stretch of young Tertiary hill country, but the population is fairly dense, nevertheless. The town of Chios has a population of 22,000. Lesbos (Mytilini) has a variety of structure, with volcanic rocks in the west, serpentine in the centre, and crystalline schists in the east. It is well populated, the chief town, Mytilini, having a population of 28,000. Lemnos and Imbros (the latter being Turkish) are composed partly of sandstones and shales, which give gentle land forms, and partly of volcanic trachyte, which gives rise to infertile hills. Both are rather low-lying.

These islands came under the Greek flag in 1913.

Of the remaining groups of islands, the Dodecanese, or Twelve Islands, belong to Italy, and like the Sporades lie near the shores of Asia Minor. The infertile Northern Sporades, however, lie towards the European side of the Ægean, though the division into Europe and Asia in this area may be looked upon as non-geographical.

GREECE (THE HELLENIC REPUBLIC)

Historical and Economic Summary.—The modern Greek state dates from the Wars of Liberation of 1821–29, when a small portion of the present state won its freedom from the Turks. The parts freed at that time were the Morea, Attica, and the adjoining lands south of a line from the mouth of the Aspropotamo River to that of the Spercheios River, together with the islands of Eubœa, the Cyclades, and the Northern Sporades.

Greece fell to the Turks in the fifteenth century at the time of the overthrow of the Byzantine Empire, but for the previous two centuries it had been under the rule of the so-called Franks, who were adventurers of French origin, and of the Venetians, who together had turned the Fourth Crusade against Byzantium in 1204. The Frankish feudal lords, who had divided up the country amongst themselves, so impoverished the land by incessant warfare against each other that it could offer no resistance to the Turkish conquerors.

There are few Turks remaining in Greece at the present time, but from the remotest times there seems to have been an intermittent pressure of population from the north, so that the population of modern Greece is racially more mixed than that of ancient Greece, which was apparently even then of mixed Mediterranean and northern origin.

Apart from the prehistoric invaders, who brought iron weapons and stimulated the great flowering of Hellenic civilisation, there have been "Macedonians," Albanians, various types of Slavs, Vlachs, Turks, "Franks," Venetians, and other Italian settlers. Few of these have left any obvious traces, and Greek speech and a Mediterranean mode of life have quietly prevailed.

It may be worth noting here that before 1830 there had never been a single united Greek state, for the city states of ancient Greece, though allied at times, were independent of each other. Also from the time of the Macedonian conquest onwards (338 B.C.) the Greeks had never had self-government, but had always been ruled by aliens.

From 1829 to 1919 the area under Greek rule greatly increased. Having obtained the greater part of Macedonia as a result of the Balkan Wars against Turkey (1911-13), and thereby doubled in size, it became the Greek ambition to bring all the Greek-speaking people under one flag; hence the attempt to obtain possession of the western part of Asia Minor. Greek-speaking people had occupied these shores since prehistoric days, though in course of time they had become much intermingled with Anatolian stock. The result of the 1918-23 attempt to bring these lands under Greek rule resulted in vigorous Turkish resistance and the final expulsion of all Greeks from Turkey, with the exception of those in Constantinople (Istanbul). These emigrants, who numbered nearly one and a half millions and were mainly farmers, carpet-weavers, artisans, and merchants, greatly swelled the population of the Greek state, and would have proved a very difficult problem if money had not been forthcoming from American, British, and French sources to prepare the sparsely-peopled basins of Macedonia, Thrace, and Thessaly for their reception. The non-farming element was mainly settled in Athens, Salonika, and Volos, and is occupied to a considerable extent in the manufacture of carpets and ceramics and in the tobacco industry.

The reclamation of the basins of Macedonia, Thrace, and Thessaly is having the effect of greatly increasing the supplies of grain—needed for home consumption—and of tobacco, which is the leading Greek export. This tobacco, of which over half comes from Macedonia, is marketed under the name of "Turkish" tobacco and is the finest of that type in the world. Turkey itself now produces very little.

The mineral wealth of Greece is varied, but the individual minerals do not seem to exist in any great quantities, though it cannot be said that the resources are fully known. The crystalline massif of the Cyclades and south-east Attica contains silver-lead, worked from the days of antiquity at Laureion in Attica, emery, worked at Naxos, iron-ore, and zinc. The marble of Pentelikon is famous.

Manufactures are little developed, though the working up of agricultural products from wheat, olives, and vines is widespread. Textiles form the chief branch of real factory work, though the country is not self-supporting in this respect. Mention has already been made of the new carpet industry at Athens. There is a prohibitive tariff on imported manufactured goods, but this apparently does not give the intended stimulus to home manufactures, owing to the same combination of unfavourable conditions that prevails in the rest of south-eastern Europe, *i.e.* lack of coal or other fuel, of iron-ore, and of capital and experience.

Practically all the Greek exports are specialised agricultural products. After tobacco come currants, wine, sultanas, olive oil, olives and dried figs. The list of imports is usually headed by grain, with textiles coming a poor second. Coal, sugar, timber, raw cotton, and rice are also imported. There is an adverse balance of trade, the imports being valued at twice as much as the exports, but this is partly offset by savings sent home by emigrants and partly by the earnings of the mercantile marine. Comparisons with Norway will here suggest themselves.

The nineteenth century saw a great renaissance of Greek shipping, especially in connection with the grain trade of the Black Sea. This took place at a time when it was still profitable to use sailing ships, and the change to steam came late. At the present day the Greek mercantile marine is relatively small, though large per head of population, the tonnage of engine-driven vessels amounting to 1,711,000 in 1935. Greece, however, still has a considerable carrying trade in the eastern Mediterranean.

REFERENCES

There is no text-book on the regional geography of Greece in English. *The Greek Commonwealth*, by A. Zimmern (5th ed., Oxford, 1931), gives an excellent account in the introductory chapters of the unchanging elements of the Greek land and life. O. Maull's *Griechisches Mittelmeergebiet* (Breslau, 1922) is a useful little book.

Topographic maps on a scale of 1:100,000 are published, but the series is not complete.

SECTION II—WESTERN EUROPE

CHAPTER IX

GENERAL INTRODUCTION TO WESTERN EUROPE

THE British Isles, France, Belgium, and Holland may be conveniently grouped together under the title of western Europe. The region is not so clearly a unit as southern Europe, but the various countries have certain similarities. For instance, climatically they all have a similar oceanic régime, structurally they lie mainly within " Hercynian " Europe, and in relief they consist mainly of ancient horsts alternating with fairly extensive plains. The main exceptions are the southern and south-eastern parts of France, which lie within the region of Mediterranean climate or of Alpine folding or of both, and the northern parts of Scotland, which resemble Scandinavia in structure and relief. The various countries have also been closely bound up with each other in their political and economic history, and developments took place there which have profoundly changed the face of the world during the past two centuries and which still continue to make their influence felt even in Europe itself.

Western Europe was fortunate in coming in contact with Roman civilisation at an early date, an occurrence which was aided, no doubt, by the facility of access from the Mediterranean Sea through France by the Rhône-Saône corridor and the Aquitaine basin, whilst the mild oceanic winters were not unkind to a southern people. Moreover, in spite of the barbarian invasions of the fifth century and after, civilisation was not completely swept away, and in many cases the barbarians themselves had been already in contact with the Roman power. Since the intruders mainly came from the east, the westerly position protected the region from receiving the most uncivilised type of invader, and also saved it from some of the invasions altogether, the brunt of which fell on the peoples of central and eastern Europe. Consequently western Europe was able to develop with relatively few checks, once it had recovered from the long series of

invasions which ended about the beginning of the tenth century, whereas aggression on the part of invaders in eastern Europe continued right down into the seventeenth century, and even later, *e.g.* on the part of the Tartars in Bessarabia.

In spite of the fall of the Roman Empire, the pattern and inspiration for western civilisation all through the Middle Ages continued to be the Mediterranean lands, whose people also took the lead in the discovery of America and of the sea route to the Indies, though the English, Dutch,

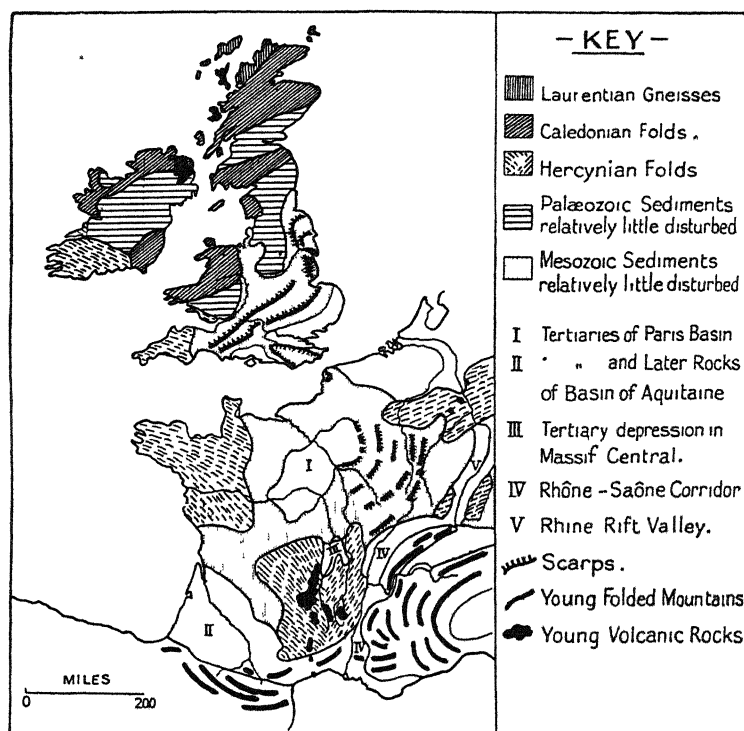


FIG. 32—STRUCTURAL DIAGRAM OF THE BRITISH ISLES AND FRANCE

and French reaped the benefit. It was not until the end of the eighteenth century that developments took place in western Europe which gave an entirely new turn to civilisation, and which also gave the countries of western Europe a decisive lead. These developments were associated with three "revolutions," usually known as the French Revolution, the Industrial Revolution, and

the less widely known Agricultural Revolution. It is true that the ferment which became obvious during the eighteenth and early nineteenth centuries had been working silently for a long time, but the rest of the world had hitherto paid little attention. The French Revolution brought to the notice of the greater part of Europe the idea of personal liberty, which had slowly become established in England and the Low Countries (Belgium and Holland) during the previous five centuries, whereas up to the time of the French Revolution individuals in most of the other countries, including France itself, were still bound by feudal restrictions, which among other things hindered their free movement from place to place, and imposed severe restrictions on the occupations they could adopt. These restrictions applied not only to serfs, who were economically bound to the soil, but also to other ranks ; for instance, a German noble was not allowed to practise a trade or to become a manufacturer, and a German burgher was not allowed to own a landed estate. The liberation of the individual, though it took place in England and Belgium from no humanitarian motive, set free an abundance of talent and enterprise, which first made themselves felt in those countries where feudal restrictions first disappeared. Without the break-up of the feudal organisation of society it is doubtful whether the Agricultural and Industrial Revolutions could have taken place.

The Agricultural Revolution led to a great increase in the yield from the soil by substituting an improved system of agriculture for the old methods which had been practised with little alteration from Roman times and even earlier. The chief change lay in the abolition of the wasteful biennial or triennial fallow, a change which was only made possible by the adoption of heavy manuring, and which usually involved also the abolition of what is known as the "open-field" system of farming. The great hedgeless open-field of each village had been divided usually into three sections, one of which was devoted to wheat, the second to a spring-sown cereal, and the third lay fallow, the rotation usually being rigidly enforced. Each landowner held one or more strips in each section of the field, instead of holding all his land in one continuous farm. Consequently there was little opportunity for experiment or improvement. In addition, each village possessed common land for the grazing of live-stock, though the fallow land

was also largely used as common pasturage. This old system persisted in Russia as late as 1917, and is still found in backward countries, such as Bulgaria, Lithuania, etc., but was done away with in England mainly under the Enclosure Acts of the eighteenth and early nineteenth centuries, and in southern and eastern England had disappeared considerably earlier. The new methods had indeed been evolved in Flanders as early as the thirteenth century, but were first adopted on a large scale in England, later in the other lands of western Europe, and finally spread to eastern Europe in the twentieth century. The new methods brought more land under cultivation, resulted in much heavier yields, allowed for a greater diversity of crops, and provided more and better food for a rapidly increasing population.

This revolution put Europe in the forefront of the agricultural continents. It is not always realised that Europe is a greater producer of foodstuffs than the great exporting continents, such as North America, yet Europe produces more wheat, meat, and dairy produce than all the rest of the world put together, more than twice as much barley and nine times as many potatoes. It also produces nearly half the world's sugar.

In spite of this large home production, Europe has to import more food than all the other continents combined, in order to feed the large industrial population which has come into being as a result of the Industrial Revolution.

The Industrial Revolution originated in England, and is perhaps the most important of the three revolutions mentioned. It caused and is still causing immense changes in the distribution of population, in the methods and localisation of industry, in the methods and routes of transport, in the type and quantity of raw material needed, and indeed in practically every aspect of human life.

GREAT BRITAIN AND THE INDUSTRIAL REVOLUTION

The Industrial Revolution hinged on the invention of steam-driven machinery, which required coal to feed it and iron for construction if it was to stand the strain of the new driving power. Since the mechanism of the steam-engine is supposed to have been known to the ancient Greeks, but remained neglected for nearly 2,000 years, its re-invention in England might have remained equally local and unknown but for a series of favourable factors, which led to its great improvement and its rapid adoption

for different kinds of work, including the mechanisation of the iron and textile industries and of transport. This rapid adoption seems to have been due to the fact that Great Britain had already developed overseas markets (mainly for textiles) which were expandable at such a rate that any invention which would speed up production and cheapen costs was seized upon with avidity. This market consisted largely of colonies obtained—mainly at the expense of the Dutch and the French—during the eighteenth century, when the English definitely established themselves as supreme at sea. With the mechanisation of production, the increased quantities of manufactured goods available and the low costs of production, the British Isles were enabled to secure the "whole world" as a market for nearly a century, though other regions, equally well equipped by nature, have since successfully challenged her monopoly.

Two of the fundamental necessities were therefore coal and iron, which occur in Great Britain, though not in Ireland, in large quantities. The steam engine was invented in 1710 to pump water out of coal mines, a significant fact because very few other parts of the world at that time were using coal for fuel, timber being the usual fuel in the forest belts, and straw or dried dung in the non-forest areas. England, however, was suffering from a shortage of timber as early as the eighteenth century in spite of being in the forest belt, a shortage which may at first sight seem surprising. It should be remembered, however, that the soils of the south-eastern lowlands were good enough to be cleared for agriculture, apart from the growing of the great oaks needed for shipbuilding and other constructional purposes, and, on the other hand, the bare uplands and mountains of the north-west seem never to have been forested within historic times, either because they were too windswept or because the soil was too porous, too scanty, or otherwise unsuitable. Moreover, the British Isles have only one quick-growing native conifer, the Scots pine, and this seems to be a survivor from prehistoric climatic conditions and now reproduces itself with difficulty. As early as Milton's time the Baltic lands supplied Great Britain with timber products such as masts, tar, etc. Coal, on the other hand, was plentiful, so near the surface in parts that it could be mined by means of adits or shallow pits, and so near the sea-coast that this bulky material could actually be

transported for hundreds of miles, *e.g.* from the Durham coalfield to London where was the greatest demand, hence the old term "sea-coal." Land transport for such a heavy and bulky commodity was quite impossible before the Industrial Revolution, and Great Britain lacks large navigable rivers for successful inland water transport.

The steam engine did not become a really useful generator of energy until the improvements by Watt in 1782 reduced the amount of coal required and allowed of its use at a distance from the actual coal mines and for divers purposes. By that time methods of smelting iron by means of coke, in place of the scanty supplies of charcoal, had been invented (*c.* 1730) and had become generally known (*c.* 1750), the canal system had been started mainly with a view to transporting coal, the first canal being built in 1761. The manufacture of cotton goods had already begun, the invention of the spinning "jenny" (1767) and Arkwright's water-frame (1768) had speeded up the production of yarn, and the latter brought in the use of water power. Crompton's "mule" (1775) combined the virtues of the jenny and the water-frame and enabled very fine yarns to be spun.

The change from small, home hand-manufactures to large-scale factory industries using steam power, and the development of great industrial agglomerations came slowly, but the Revolution had been achieved in its essentials by about 1830. The building of the canals and the invention of railways and the steam locomotive allowed food to be transported to the new densely populated industrial areas, raw materials to reach the factories, and the finished product to be distributed to internal markets or the seaboard. The rapid increase in wealth during the period depended mainly on the export of textiles, of coal, and of iron and steel goods to the rest of Europe, and to the Americas. Once mechanisation was started one branch of mechanised industry helped another. Never before had the world seen such a brilliant outburst of inventive genius.

It may perhaps be argued that a series of fortuitous events combined to start the Industrial Revolution in England rather than in any other part of the world, but since the question involves the whole problem of the origins of culture and the whole range of the world, it is too vast to be treated here, except in bare outline and as regards Europe.

England's possible economic competitors at the end of the eighteenth century were those countries of Europe which already possessed considerable manufacturing industries at home, foreign or large home markets, some kind of transportable power capable of driving machines, and capital and labour available for expanding industries. A little consideration will show that the countries possessing these advantages at that time were very limited in number. Germany, which subsequently became England's chief European rival in industry, was only a "geographical expression," a mosaic of over three hundred states divided from each other by separate customs barriers and still so completely in the feudal age that the bulk of the population was tied to the soil in serfdom and therefore unable to engage in manufacturing, while the manufacturing guilds of the towns were sufficiently strong to prevent any innovations and to prevent others from competing. On geographical grounds the great Ruhr coalfield of Germany offered possibilities for the development of early mechanised industry, since the coal occurred at the surface, near iron deposits, near old-established iron and textile industries, and near the navigable waterways of the Rhine system. (*See Chapter XX*) These advantages, however, were negated for a time by non-geographical factors, though they ultimately prevailed.

Of the countries with considerable seaboard, overseas possessions, and trade, only France possessed any considerable deposits of coal, but, like Germany, was still hampered by the survival of feudalism and the lack of a banking system. However, before the great disturbance given to economic life by the French Revolution, France had copied England's example and had begun the mechanisation of the cotton industry, using water-driven machinery as in England, and had also begun the smelting of iron by coke; in both cases using smuggled English designs. The French Revolution and the Revolutionary Wars put a stop to the normal economic development, and by the time peace was restored on the Continent, England had definitely established her world lead.

The inventions made in England and Scotland in connection with the Industrial Revolution were gradually introduced into other countries of Europe, and into the U.S.A. This process was slow, partly owing to Britain's efforts to stop the leakage of information in regard to the new

machinery, partly owing to the tremendous start gained by Great Britain, partly owing to internal disturbances and cultural backwardness in the southern and eastern parts of Europe. In one way or another, however, practically the whole of Europe was influenced by the Industrial Revolution by the end of the nineteenth century, Russia being the last of the great countries to be affected. Those countries which were well endowed with coal and iron themselves, particularly Germany, Belgium, and France, established great industries on similar lines, mainly behind defensive tariff walls. Those countries which had little or no coal either imported British coal

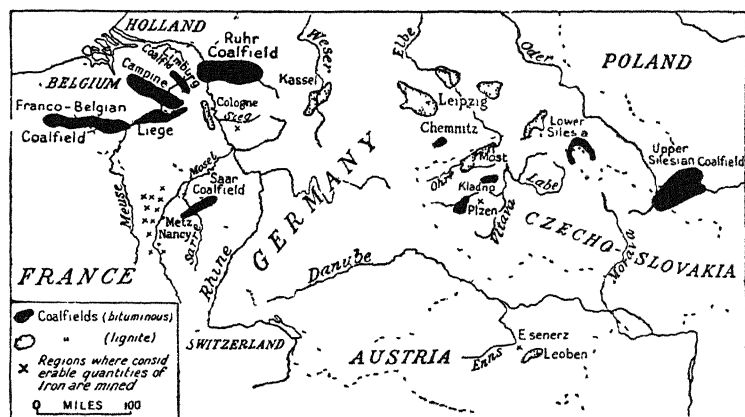


FIG. 33—THE GREAT COALFIELDS OF CENTRAL EUROPE, FRANCE, BELGIUM, AND THE NETHERLANDS, TOGETHER WITH THE CHIEF IRON-ORE WORKINGS

for their manufacturing industries, or found their own expensive hand industries killed by the cheaply produced factory goods. In many countries both processes took place almost simultaneously, *e.g.* in Sweden and Italy. The invention of railways and the steam locomotive on the whole helped Britain's economic rivals, particularly the more continental powers, and to some extent negated Britain's initial advantages, by enabling widely separated iron and coal supplies to be brought together.

The great new urban agglomerations made demands for foodstuffs on a scale hitherto unknown, while the new improvements in transport enabled foodstuffs to be imported from a great distance. In response to this demand, large-scale farming for export began on the

prairies of south-eastern Europe even before it began in America, and the new cheap foodstuffs sounded the death-knell of grain production in those parts of Europe less favoured by climate, relief and soil. Thus in Great Britain and Ireland, the Scandinavian countries and Denmark, in fact in all the rainy areas of north-western Europe, arable farming declined, to be replaced by specialised dairy farming in, *e.g.*, Denmark, Holland, Scandinavia, whose products found a ready market in the industrialised countries.

The present slump in world prices, the world-wide unemployment among factory workers, and the so-called over-production in agriculture, seem rather to be due to a breakdown of the means of exchange than to any real over-production in either industry or agriculture, but as regards the export of manufactured goods from Great Britain, it is certainly true that the market, both in Europe and farther afield, is relatively much smaller than it was fifty years ago, and this is mainly due to the development of industry in other countries, not only of Europe, but also of America and Asia. Also, Britain's coal exports are now less in demand owing to the development on the continent of hydro-electricity and to the use of mineral oil.

REFERENCES

On the Industrial Revolution J. H. Clapham's great work entitled *An Economic History of Modern Britain* (vol. I, *The Early Railway Age*) (Cambridge, 1926), and the same author's *The Economic Development of France and Germany, 1815-1914* (Cambridge, 3rd edn, 1928), give a wealth of interesting detail. L. C. A. Knowles' *The Industrial and Commercial Revolutions in Great Britain during the Nineteenth Century* (London, 1911) gives a shorter account. The first of the above-mentioned works also gives some account of the Agricultural Revolution, but the contemporary writings of Arthur Young and Cobbett (*Rural Rides*) are easily accessible and give vivid pictures.

On the British Isles, J. H. Mackinder's *Britain and the British Seas* (Oxford, 2nd edn, 1906), *Great Britain*, edited by A. G. Ogilvie (Cambridge, 2nd edn, 1928), *Les Îles Britanniques*, by A. Demangeon (Paris, 1927), and *The British Isles*, by L. D. Stamp and S. Beaver (London, 1933), are standard works. See also *The Land of Britain*, The report of the Land Utilisation Survey of Britain, edited by L. D. Stamp (London, 1937 and onwards).

CHAPTER X

FRANCE

APART from the bordering chains of the Alps and the Pyrenees, France belongs structurally to the Hercynian region of Europe with its old massifs and its included basins and scarplands.

The advantages of its position and physical lay-out have often been stressed. It is the only country of Europe, except Spain, which has coastlines on both the Mediterranean and the Atlantic,² and in the case of France these coasts are mainly bordered by lowlands which allow easy access inland, whereas Spain is hampered by the presence of coastal mountains which hinder movement to and from the interior.³ Instead of the mountain rampart, which elsewhere borders the northern side of the Mediterranean Basin, there is here a great depression represented by the Gulf of Lyons (Fr., Golfe du Lion), from which two easy routes lead northward into the great lowlands of northern and western France, the most important being the Rhône-Saône route leading due north towards the lowland known as the Paris Basin, and the other, leading north-west *via* the Carcassonne Gap, into the lowland basin of Aquitaine. These natural routes allowed the early spread of Mediterranean civilisation northwards into France beyond the range of Mediterranean climate, and France is the only non-Mediterranean country where Roman civilisation retained its hold despite the subsequent barbarian invasions.

At the present day the Rhône-Saône route in particular is of great commercial importance, since it puts the densely peopled lands of northern France, Great Britain, and the Low Countries (Belgium and Holland) into easy communication with the Mediterranean-Suez-Orient route. Not only does it immediately connect two natural regions of unlike climate and products, that is to say, the summer-drought region of the Mediterranean with the rainy region of north-west Europe, but it also provides a useful link in one of the great commercial highways of the world. As already noted in Chapter I the only other easy natural

route through the northern mountain-border of the Mediterranean Sea is *via* the Bosphorus and Dardanelles, but the western route through France is more important commercially at the present time, because western Europe is more thickly populated and more developed economically than eastern Europe. Passenger traffic is particularly important owing to the saving of time *via* the Rhône-Saône land route as compared with the long sea route *via* Gibraltar round Spain and Portugal and through the Bay of Biscay.

Among the advantages of the physique of France the large percentage of lowland must take a foremost place. None of the great established countries of Europe has so much, with the exception of Russia where the advantage of possessing a great expanse of lowland was negated by adverse climatic and historical conditions. Moreover, the lowlands of France are in the main fertile, and further, there is easy communication between them.

A favourable climate is ensured both by the position and relief of the country. Lying between latitudes 42° N. and 51° N. France possesses only a narrow southern strip within the Mediterranean climatic province, while the rest has cyclonic rain throughout the year. Since, however, the southern coastlands of France lie on the northern edge of the belt of Mediterranean climate the period of winter rain is prolonged even here, and there is rarely excessive drought, while the near presence of high mountains provides water for irrigation. The relatively low latitude of even the rest of France gives the country a climatic advantage over the other parts of Europe which have also abundant cyclonic rain, since not only the fertile lowlands, but the slopes of the mountains themselves, can be cultivated. Whereas in England at latitude 55° N. cultivation ceases above about 700 feet, in the French Alps of Savoy about latitude 45° it can be carried up to 4,500 feet (*see* Fig. 1), and even above 6,000 feet in favourable exposures and slopes. Moreover, the hotter summers and shorter winters allow the cultivation of a greater variety of crops, including the heavy yielding maize and the valuable vine. Of late years, also, the advantage of the early spring has been realised in the cultivation of early vegetables and fruit for the dense industrial populations of lands farther north, particularly of Great Britain. The disposition of the mountains and plains allows the penetration over the whole country of the rain from the west.

In addition to the rich agricultural possibilities of France, the country also possesses considerable wealth of minerals and water-power, though in regard to coal, the essential fuel of the modern world, the endowment is not very great, France being fourth among the coal-producing countries of Europe. The only really important coalfield, moreover, is situated on the very border, in the north-east, so that distribution to the south and west of the country is costly. Moreover, owing to the nature of the seams, the coal is difficult to mine and therefore expensive, and the cost puts a brake on industrial development under modern conditions, especially when foreign fuel is denied admittance. The deposits of petroleum are negligible, but the hydro-electricity available in the rivers of the French Alps and Pyrenees is reckoned to put France fourth among European countries in regard to the amount of potential water-power, and of this a good deal is developed. In iron, however, the great present-day industrial necessity ranking second only to coal, France is the richest country in Europe and the second in the world, the iron mines of Lorraine yielding over forty million tons of ore per annum in some years. (*See Appendix C and p. 134.*)

Structure and Relief.—The main outlines of the structure and relief of France are simple.

There are four Hercynian horsts, namely the Massif Central, the Armorican Massif, the Vosges, and the Ardennes (*see* Fig. 32). The first three are wholly in France, the last extends through Belgium to join the Rhine highlands. These horsts, in common with most of the other Hercynian massifs of Europe, were worn down to base level and generally submerged beneath the Cretaceous Sea, only to be raised again in Tertiary times in connection with the earth movements involved in the formation of the young folded mountains. The horsts nearest the Alps underwent the greatest uplift, particularly the Massif Central and the Vosges, but the Armorican Massif was raised relatively little. All these horsts consist mainly of Palæozoic and earlier rocks, including a considerable proportion of granites, gneisses, and other hard rocks which provide thin infertile soils. The Hercynian massifs of France generally form dissected infertile highlands, with the exception of the Armorican Massif which is dissected and infertile, but is mainly below 600 feet in height.

Round the Massif Central there are three basins of sedimentation. The Paris Basin and the Basin of Aquitaine form the principal lowlands of France, and are composed of strata of Secondary and Tertiary age. In the Paris Basin the formation of scarpland structure is well developed, particularly on the east, since the upthrust of the Vosges Massif caused a pronounced tilting of the strata and allowed erosion to emphasise the difference between the harder and softer rocks. The Saône-Rhône depression may also be looked upon as an area of sedimentation, but some of the rocks became involved in the Alpine folding so that the area of lowland is now narrow.

The young folded mountains of the Alps and Pyrenees form the frontiers of France on the south-east and south-west. On the eastern frontier, France also includes portions of the Rhine rift valley and of the Belgian Basin of sedimentation with its valuable coalfield.

NATURAL REGIONS

The Paris Basin.—*General.*—This is the most important agricultural lowland of western Europe, both as regards size and productivity. It measures some 200 miles from the English Channel (Fr., La Manche) to the Massif Central, and some 300 miles from the Armorican Massif to the Vosges. The greater part of the area is under 600 feet high, except in the eastern part (Lorraine), which, though geologically part of the basin structure, is often placed in a separate geographical region on account of its differences of relief, drainage, and economic development.

Structurally the basin is formed of strata of Secondary and Tertiary rocks which were laid down on a gradually sinking floor. During the Tertiary period the outer edges were slightly tilted up like the rim of a saucer, and the forces of erosion set to work to strip off the upper and younger layers, especially from the higher outlying part of the basin. Accordingly the older strata are now exposed round the rim and progressively younger strata are met as one goes towards the centre. The oldest rocks belong to the Triassic system and are found bordering the Vosges in Lorraine, but as the basin was mainly land in his period the deposits were limited in extent and no other outcrops occur, though borings reveal rocks of this age on the southern and western borders. The Jurassic system is much more widely represented, and rocks of this

age probably floor the greater part of the basin, and they appear at the surface in a horseshoe-shaped outcrop on the eastern, southern, and western sides. On the north this formation only appears in denuded anticlines. The Cretaceous formation outcrops in a great ring, somewhat irregularly shaped, round the Tertiary beds of the middle

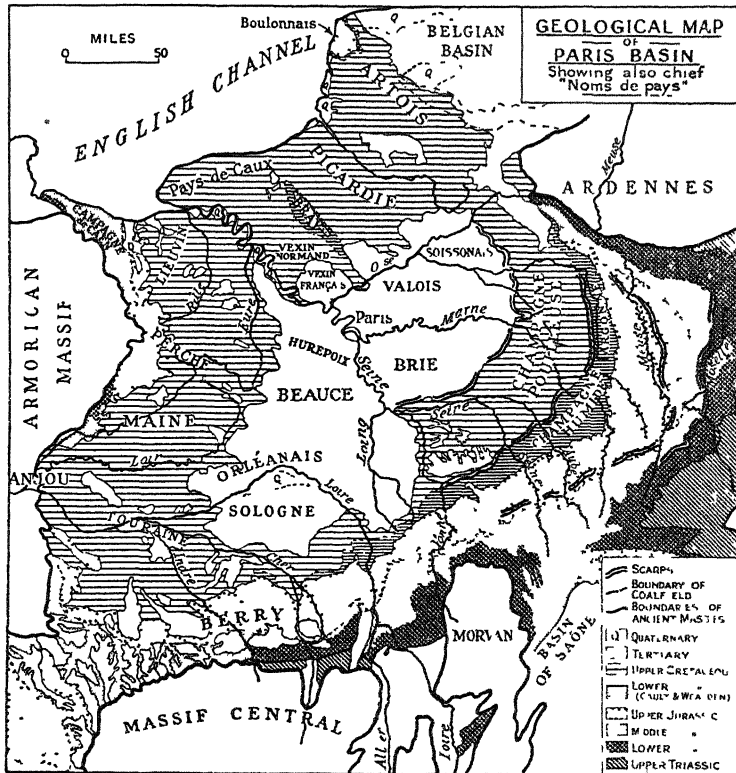


FIG. 34 —GEOLOGICAL MAP OF THE PARIS BASIN.

of the basin. These Tertiary beds have their longer axis from north-east to south-west and are transgressive over the Jurassics in the south of the basin.

The strata consist of very varied types of rock, and the effect of denudation and peneplanation has been to produce rapid alternations of outcrop. The formation of scarps was thus favoured, and these are particularly noticeable in the eastern part of the basin, partly because the dip or

tilt of the rocks is greater, partly because of the alternation of layers of rock of contrasting type and partly because a greater number of formations are represented. The basin is also crossed from north-west to south-east by a number of shallow folds, but apart from the north-eastern region, these rarely have any effect on the relief. The rapid alternation of outcrops naturally causes rapid alternations of landscape, a fact which has long been appreciated by the inhabitants who have applied distinctive local names (*noms de pays*) to regions which possess distinctive individuality, though this individuality is not always very noticeable to the traveller at first sight.

The Paris Basin possesses in marked degree the type of variety which was needed before the Industrial Revolution when almost all the needs of man had to be supplied in a comparatively small area. There is land suited to wet crops and dry crops, to cereals and market gardens, to vine and to orchard; there are dry pastures and wet pastures, the first suited to sheep and the second to cattle; there are wooded areas for supplying timber for fuel and building; there is good building stone, markedly absent from the similar London Basin, as well as material for bricks, cement, and plaster of Paris. There are also small bodies of iron on the borders of the basin which were useful before the vast Lorraine iron-field could be worked. And to bring these commodities from one place to another was the useful, slow-moving Seine and its tributaries, which are still of considerable importance, in spite of the development of railways and roads.

The basin may be conveniently divided into five subdivisions as follows: (a) the central region with Paris, (b) the scarplands of Champagne and Burgundy, (c) the scarplands of Lorraine, (d) the south-west and middle Loire region, (e) the coastal regions of Normandy and Picardy.

In addition, the region of the lower Loire may be conveniently treated here, although geologically it belongs to the Armorican Massif.

The Paris Basin.—(i) *The Central Region, including Paris.*

—This region corresponds broadly to the outcrop of Tertiary deposits, but without their southern extension in the region of the middle Loire. These deposits constitute a complex alternation of limestones, sandstones, and clays, with a general predominance of limestone which forms the most widespread subsoil, a noteworthy and

advantageous contrast to the London Basin, where in a similar position the clays predominate. The limestone plains, usually about 300 to 600 feet high, are mainly covered with superficial deposits of loam (*limon*). This is a finely grained deposit, believed to be residual from the erosion of now vanished Tertiary beds, and it forms very suitable soil for the cultivation of cereals and beet-sugar. In parts, however, particularly south-east of Paris, the place of the *limon* is taken by the impermeable clay-with-flints, and dairy cattle become important on these heavier and moister soils. Towards the centre of the basin, near Paris, the converging rivers have slightly incised their valleys and have cut up the level limestone plain or low plateau into isolated patches. They were able to do this owing to the lowering of the base level of erosion which took place in Pleistocene times, and in doing so they have exposed small areas of sandstone and clay which are usually less fertile than the limestone, the sands in particular being often left under forest. The alluvium of the valleys themselves contrasts rather markedly with the stretches of dry plateaus between them, and allows the cultivation of green vegetables and other market-garden produce needing a good deal of moisture.

Apart from Paris the whole central region is entirely agricultural, but many *noms de pays* indicate slight differences between one part and another. Of these, Beauce, situated midway between the Seine and the great bend of the Loire, possesses the most marked individuality. The level limestone plain, covered with a great thickness of *limon*, is very fertile in spite of the absence of running water. With its lack of trees and devotion to cereals and beet-sugar, Beauce recalls very strongly the löss-covered regions of central and eastern Europe. It is one of the main granaries of France. In Hurepoix, between Beauce and Paris, the limestone has been eroded by many small streams and the underlying sands and clays appear. When sufficiently fertile these are devoted to market-gardening for Paris, but otherwise have been left under forest (as in the case of the sands of Fontainebleau), and the district forms a "playground" for the great city. East of the Seine, the different types of landscape alternate with each other to a greater extent. Brie, between the Seine and Marne, has considerable areas covered with clay-with-flints in addition to *limon*-covered stretches, and is noted for the variety of its rich agriculture. In particular its

cheese is well known. Soissonais and Valois show an alternation of limestone plateaus and humid valleys.

The central basin terminates on the east in a well-defined outward-facing scarp, known as the Falaise de l'Île de France. This is pierced by a number of rivers, Oise, Aisne, Vesle, Marne, Seine, which afford easy routes converging towards Paris and which are now followed by the railways.

Apart from Paris there are no large towns in the region. This is true also for almost the whole of the basin, and though it is partly a natural result of the agricultural nature of the lowland, it is due also to the centralising policy which has been carried out for over three hundred years. The speed of railway transport has also aided this centralisation in modern times, since it takes only three hours by train to go from Paris as far as the borders of the basin in any direction.

Paris.—Paris grew up at a crossing-place of the Seine where a small island first gave protection and afterwards facilitated the building of bridges. Before the days of big ships, sea-going vessels could come up river as far as this bridge, and even to-day Paris is still a great port, though goods now come in barges. The large extent, the fertility and diversity of the surrounding country have already been emphasised, and the nodal position, with routes converging from all directions, has been suggested. The site was sufficiently favourable to attract settlers in pre-Roman times, but the city did not become the centre of administration of Gaul under the Romans, who preferred Lyons, since the latter was better situated from the point of view of external administrators, who were also concerned with communications leading to Rome and to the Rhine frontier. Paris, in fact, owes its supremacy among French cities largely to the Capet kings, who in the twelfth century chose the town as their capital. The city grew as their rule was extended from the Île de France, in the centre of the Paris Basin, over all the country which is now called France, but which took its name from the land in the immediate neighbourhood of Paris. In particular, the highly centralising policy of the French kings, especially from the seventeenth century onwards, added to the size and prestige of the city, and the large numbers of nobles and officials assembled there led to the development of a number of industries, of which the luxury trades became world famous.

Paris is to-day not only the supreme administrative centre of a highly centralised country, the chief commercial, intellectual and artistic centre, but is also actually the largest industrial centre with as many industrial workers as the coalfields of the "Nord" and the silk-manufacturing region of Lyons combined. It has long been supreme in the designing and manufacture of women's clothing and of all manner of "articles de luxe" or "articles de Paris". In addition it has long been renowned for the elegance of its furniture and for interior decoration generally, though in this branch it has been rivalled and perhaps surpassed in the twentieth century by other countries. Many other kinds of building industries are also represented in Paris. It possesses also a great variety of manufactures needing skilled labour and comparatively small amounts of raw material, such as scientific and musical instruments, jewellery, and motor-cars. Lastly, there are many industries which were established to work up the agricultural produce of the surrounding country for the dense population of the city, such as flour-milling, sugar and jam manufacturing, brewing, the making of shoes, and so on. It may here be noted that many of the other great capitals of Europe, such as London, Berlin, Vienna, and Stockholm, have similar manufactures, and also that Paris is no longer unique as a purveyor of elegance, the rise in the standard of education in western Europe having resulted also in an improvement in taste, and the demand for clothes, furniture, and decoration of good design at a cheap price has been met by the establishment of these industries in many countries.

Paris still holds an important position as an educational centre. Throughout the later Middle Ages and almost down to modern times it was the leading university city of Europe, and still attracts large numbers of foreign students, particularly from South America and from such countries of east-central Europe as Rumania and Poland, but the devotion to letters (arts) and the comparative neglect of natural philosophy (science), for which the French have hitherto shown little liking, has caused Paris to lose ground in favour of universities in England and Germany.

Like the other great capital cities of Europe, Paris draws the gifted and ambitious from all over the country, but to an even greater degree, so that the provinces lack the active mental life to be found in, say, England and Germany. Even so, however, the city has been surpassed

in size by London and Berlin, as well as by New York, its population being 2,830,000 at the census of 1936.

The Paris Basin.—(11) *The Scarplands of Champagne and Burgundy.*—East of the Falaise de l'Île de France there are a number of concentric scarps with expanses of plain and plateau between them (see Fig. 34). From beneath the Tertiaries of the Falaise comes an outcrop of chalk which forms a stretch of dry country known as "La Champagne Pouilleuse" (literally, "dusty champagne"). This rises gradually towards the east only to fall by means of a scarp to the clays of "La Champagne Humide," from beneath which permeable rocks again emerge to form the Argonne Heights, formed of Lower Cretaceous sandstone, and farther south, the Côte des Bars, a scarp of corallian limestone of Jurassic age. To the east of the Argonne rise the plateaus and scarps of Lorraine, while to the south-east of the Côte des Bars rises the plateau of Burgundy, usually called the Plateau de Langres.

La Champagne Pouilleuse extends for some thirty-five miles from east to west and twice that distance from north to south and has a marked individuality. In general there is an absence of superficial deposits, and the limestone by itself provides a poor, thin soil, for centuries devoted to sheep rearing, but during the nineteenth century partly put under cereals or afforested with pine trees. It corresponds to the English Salisbury Plain and is similarly used for army manœuvres. The open ground also provided a noted route-way from north to south in the pre-railway era, and was crossed by the east-west routes utilising river gaps in the scarps. Noted mediæval fairs were held at Troyes and Rheims. The famous Champagne wine comes from the narrow Tertiary scarp of the Falaise. As Champagne is near the northern margin of wine-production, the vineyards need a warm soil and a southern exposure, but the excellence of the wine produced seems due not only to natural conditions, but also to the excellent technique employed in its manufacture. The wine is largely exported, particularly to Great Britain. Rheims (117,000)¹ is the great organising centre of the industry, followed by Epernay on the Marne. Both are gap towns. The only other town of any size is Troyes (58,000), an isolated cotton-manufacturing town, specialising in knitted goods.

¹ Population figures are from the 1936 Census.

The Plateau de Langres forms a threshold of rather high, scantily peopled country between the lowlands of the Paris Basin and those of the Saône. In general the plateau is over 1,000 feet above sea-level. The Jurassic limestone here reaches a great thickness and there is little surface water except in the valleys, which deeply dissect the plateau and allow canals, roads, and railways to wind through the country. In some places the valleys cut down to the impermeable Liassic marls, and rich valley pastures result. The oolitic limestone forms a scarp overlooking the Saône Valley, particularly in the west, where it rises to more than 2,000 feet above sea-level and is known as the Côte d'Or.

The Paris Basin.—(iii) *The Scarplands of Lorraine.*—Structurally all the land west of the Vosges in Lorraine belongs to the Paris Basin, and consists of successive outcrops of Jurassic, Lias, and Triassic beds. Lorraine, however, differs in many ways from the rest of the basin. Apart from its rivers draining northward instead of westward, it is also higher, averaging between 900 and 1,000 feet, while the Côtes de Meuse reach over 1,300 feet. Consequently it is bleaker and wetter. The soils also are generally less fertile owing to the absence of *limon*, but the subsoil contains large deposits of minerals, particularly of iron.

The two main outcrops and scarps of Jurassic limestone are the Côtes de Meuse (corallian) to the east of the River Meuse and the Côtes de Moselle (oolitic) to the west of the River Moselle. These outcrops are both infertile zones of scanty population, mainly under forest. Between the two is the clay vale of the Woëvre, with fertile but heavy soils, while east of and overlooked by the 800-feet-high Côtes de Moselle is the largest area of lowlying and relatively fertile land in Lorraine. This lowland extends for over 100 miles from the Luxembourg lowland in the north to the low Mts. Faucilles in the south, and is developed on four types of rock, the Lias clay, the Keuper sandstones and marls, and the Muschelkalk, the latter being, as its name implies, a shelly limestone. The Muschelkalk forms the low hills of the Mts. Faucilles in the south in which the Saône rises, but farther north it does not form a perceptible scarp. This zone is succeeded by the infertile and forested Bugey sandstone (*grès Vosgien*) which forms a hilly region bordering the crystalline Vosges and reaches to the Rhine rift itself farther north.

Gaps through the scarps aided the construction of roads and railways from east to west, of which the route from Paris to Strasbourg *via* Toul and Nancy is the most important.

The main riches of Lorraine consist of great bodies of iron ore, which occur in the Lias and outcrop at the base of the oolitic scarp of the Côtes de Moselle, from Nancy northwards to Longwy and across the Luxembourg-Belgium frontier. The deposits also extend under the oolitic plateau and are extensively mined in the region round Briey. This is the largest iron deposit in Europe and possibly the second largest in the world, being exceeded only by the Lake Superior ores in the United States of America. The deposits extend over a long narrow area some seventy miles long by about twelve miles wide, and the reserves at a modest estimate are said to amount to 4,800,000,000 tons in the French section alone, excluding those in Luxembourg and Belgium. In spite of the vast quantities of ore, the deposits were almost entirely neglected until the last quarter of the nineteenth century, for the ore is phosphoric and under the older processes of smelting it produced a brittle iron of very poor quality. The first great impetus was the invention of the Thomas and Gilchrist basic process of smelting in 1879, and the second was the discovery in 1884 of the vast Briey deposits underlying the oolitic plateau.

PRODUCTION OF IRON ORE IN LORRAINE MILLION METRIC TONS

Mining Area	1928	1930	1932	1937
Metz-Thionville . . .	20.40	20.24	11.63	15.63
Briey-Longwy	21.66	24.35	19.55	18.79
Nancy	1.50	1.41	0.64	0.99
Total Lorraine .	43.57	46.00	32.82	35.4

The establishment of a large iron industry has been hindered by the absence of a large coalfield in the neighbourhood, the neighbouring Sarre coalfield having an output of only 13 million tons or so per annum (11 million tons in 1934). There was also a pronounced shortage of labour not only for manufactures, but even for the mining itself, a shortage partly met by the importation

of Polish and other foreign labour. The political vicissitudes of Lorraine also have not helped in its industrial development. Nancy (121,000) is the only town of over 100,000 inhabitants in the whole region, and it has the advantages of being an old-established town with a nodal position, as well as being the commercial centre for the iron industry and possessing metallurgical works in the vicinity.

On the eastern border of Lorraine, cotton manufacturing is carried on in a number of small, scattered towns of which the chief is Épinal. This cotton industry is an offshoot from the Alsatian and was originally dependent upon water power provided by the streams from the Vosges.

The Paris Basin.—(iv) *The South-West and Middle Loire Region*—This region lacks the symmetry of the east of the Paris Basin, mainly on account of the widespread Tertiary deposits, patches of which lie unconformably even on the Jurassic measures. There are no well-marked scarps and the region forms a great plain drained by the Loire and its tributaries, which flow between wide low terraces, in valleys slightly below the general level. The actual flood plain is usually sandy, but the old flood plain (which now forms the accompanying terraces), and the valley sides, are regions of intensive cultivation. On the other hand, the intervening plains are only of moderate fertility, either when they are developed on the dry Tertiary and Cretaceous sands or on the dry Cretaceous and Jurassic limestone. The Tertiary sands and gravels of La Sologne were probably deposited by a large river which in Miocene times flowed northwards from the Massif Central. They are among the poorest and most thinly peopled lands of France.

The valley of the middle Loire itself, known under various local names, such as the Val de Loire, Val d'Orléans, Val de Blois, Val de Touraine, Val d'Anjou, the lower valleys of the Cher, Indre, and Vienne on the south of the Loire, and the Sarthe on the north, resemble each other in their rich agricultural development, with noted vineyards, orchards, and poultry rearing. Touraine, in particular, "with its concentration of converging valleys, has long been celebrated as the "Garden of France." The large numbers of fine old castles, particularly between Orléans and Anjou, which have earned for the middle Loire region the name of "château country" and a

certain popularity as a tourist resort, are to some extent an indication of the long-continued agricultural wealth of the region and also of its popularity with the kings of France.

The intervening sandy plains retain considerable stretches of the woodlands and heaths in which the kings of France delighted to hunt, but were mainly brought under cultivation in the eighteenth and early nineteenth centuries. On the Jurassic limestones of Berry, however, the bare treeless plain of La Champagne Berrichonne, between the Indre and Loire, resembles La Champagne Poulleuse, and for centuries was devoted to sheep, and later also to cereals. To the north of Berry, in the great bend of the Loire, lies La Sologne, on whose flat surface water stagnated and produced marshes and lakes, partially reclaimed in the nineteenth century, but even to-day large numbers of small lakes remain as haunts of wild fowl.

The threshold known as Le Seuil de Poitou is much lower than that leading from the Paris Basin to the Upper Saône. In fact, it forms no break in the agricultural plain and has the same alternation of rich valleys (here reaching down to the Lias clay and providing good fattening pastures), with intervening stretches of drier lands, which though often only of medium fertility, contrast with the ungrateful lands of the old crystalline massifs to east and west.

There are no large towns in the south-western part of the Paris Basin, though many of medium size and of historical and architectural interest, such as Orléans (73,000), Tours (84,000), Angers (88,000), Le Mans (85,000). The region is of considerable historical importance as its possession aided the Capet kings of France to expand into the basin of Aquitaine, the second great lowland of the country.

The Region of the Lower Loire.—In its lower course the River Loire flows across the old rocks at the southern end of the Armorican Massif. The region is an old peneplane of low relief, but unlike the Paris Basin, its rocks are infertile, being composed of crystalline schists, granulites and granites, and they are generally devoted to pasture, woods, and moorland. The valley of the River Loire forms a narrow ribbon of fertility across this area, and at its mouth is the considerable port of Nantes (195,000) and its outport of Saint Nazaire (40,000).

The position is not so advantageous as the site near the mouth of the longest river of France would suggest, for the purely agricultural character of the hinterland, whether the Armorican peneplane or the south-west of the Paris Basin, provides neither a large market for imports nor produces goods which are exported abroad. Nantes, however, imports "colonial" products such as cocoa, sugar, rice, palm-oil, etc., and has established factories to work them up, and also metallurgical works using imported coal. A ship canal has been built, permitting vessels of 21-feet draught to reach the port. St. Nazaire acts as an outport besides possessing the chief shipbuilding yards of France. Above Nantes the river is practically unnavigable as it suffers alternately from too little and too much water, for its upper basin and feeding area in the Massif Central consists mainly of impermeable rock, with a consequent quick run-off; moreover, the floods bring down large quantities of granitic sand which form troublesome sand-banks at low water.

The Paris Basin.—(v) *The Coastal Regions of Normandy and Picardy.*—This is the most thickly populated part of the basin apart from the central region immediately round Paris. The region is mainly developed on chalk, apart from the western section bordering the Armorican Massif where Jurassic limestone and marls appear, but both chalk and limestone are generally covered with superficial deposits of *limon* or clay-with-flints which provide good to medium soils. Moreover, the region benefits from its long sea border on the English Channel, for although the coast only possesses one great port, Le Havre, where the Seine estuary provides a good harbour, yet it has a number of smaller ports, fishing towns, and holiday resorts, some of the towns, *e.g.* Dieppe, Boulogne, combining all three functions. The central part of the region also benefits from being crossed by the most useful river in France, and the north-eastern part from being near the main coalfield of the country.

East of the Cotentin Peninsula, which belongs to the Armorican Massif, the little-disturbed sedimentary rocks of the Paris Basin begin with the Jurassic measures. A narrow strip of Liassic marls is followed eastward by the limestones of the Campagne de Caen, whose dry soils offer one of the most favourable sites for cereals in Normandy (Fr., Normandie). The port of Caen itself is linked by the canalised River Orne to the sea and exports the agri-

cultural products of Normandy (butter, eggs, vegetables) towards England, and of late years also the iron ore recently discovered here in the Silurian measures. Between the Campagne de Caen and the Seine are a number of *pays*, developed on chalk but with wide moist valleys and with superficial deposits on the chalk, which are devoted to mixed farming in which predominate the grasslands and apple orchards for which Normandy is famed. In the Collines de Perche, on the south, the Cretaceous sandstone forms one of the few features of marked relief to be found in the western part of the Paris Basin.

East of the Seine the deposits of *limon* covering the chalk in the pays de Caux provide a good soil for wheat and beet-sugar, and agriculture approximates to that of Picardy (Fr., Picardie), but the Vexin Normand south-east of Rouen with less *limon* has more diverse farming.

The old historical name of Picardie is still often applied to the northern part of the Paris Basin on either side of the Somme. This region is traversed by a number of gentle anticlines and synclines running from north-west to south-east, of which the chief are the denuded anticline of Bray, which borders the region on the south-west, the syncline of the Somme-Avre Valley, and the anticline of Artois, which borders it on the north-east and which is denuded in the west to form the Boulonnais. The denuded anticlines disclose sands and clays below the chalk and are moist lands suitable for cattle-pasture, but the rest of the area is essentially an undulating lowland of *limon*-covered chalk. Patches of clay-with-flints and the presence of four wide, marshy valleys rescue the region from the monotony of, say, La Beauce, but there is a marked devotion to arable farming, particularly for wheat and beet-sugar, and in connection with the by-products of the latter, supplemented by forage crops, there is an important cattle-rearing industry which during the last fifty years has taken the place of the former sheep-rearing. The valleys in general are waterless, as in all the chalk country, but a few rivers still maintain their way, in spite of the lowered water-table. Of these the most important is the Somme, whose marshes formerly served as a marked obstacle to movement from east to west, but have largely been reclaimed and devoted to market-gardening. The old towns of Amiens (94,000) on the Somme and St. Quentin farther east on the old route between Flanders

and Paris both have isolated textile industries, originally working the local wool, now mainly cotton, jute, and linen. Numerous sugar crushing and refining mills are to be found in the countryside.

The Coast.—The English Channel was formed as late as Quaternary times when man was already on the earth, and previously its site had been occupied by the valley of a large river, which was fed by tributaries both from England and France, and which rose presumably in the Wealden-Artois anticline and flowed south-westwards. When the marine invasion started, cliffs began to form and the remains of truncated tributary valleys may be seen along them, *e.g.* between Tréport and Ault. Since then oscillations of level have occurred, but generally the coast is cliff-edged, with gaps where the rivers reach the sea. Along the Picardie coast, however, the change in direction from east-west to north-south allowed the building of sand-spits (*cordons littoraux*) with material derived from the cliffs of La Caux, so that between the sand-spits and the old cliff-coast lagoons were formed, which silted up and formed first marshes, and later with the aid of man were turned into dry land. The whole coast is thus generally inhospitable, apart from the estuaries, and these in their narrow chalk valleys are, with the exception of the Seine, too small for large vessels, even the small cross-Channel steamers having to be backed in to Boulogne as they are unable to turn. Boulogne and Fécamp are the most important fishing ports, the former and Dieppe being noted packet stations with respectively about 500,000 and 250,000 passengers in transit annually.

Only the Seine estuary affords entry to large vessels and in addition offers a way far inland. Le Havre (164,000) is a modern port developed to meet the growing size of ships, and the Seine is here bordered by a sufficient breadth of alluvium for docks to be excavated. In addition to its goods traffic it is also an important liner and passenger port, although menaced by the development of Cherbourg. Rouen (123,000) is the old historic port of the Paris Basin, and is situated at the lowest bridging point, but although on tide water it is about 90 miles up the winding river and vessels drawing more than 5 metres cannot reach the port. It is the chief coal and oil importing port of France and the place of transhipment to the Seine barges. It also imports goods for its own industries, particularly the cotton textile industry.

The North-Eastern Industrial Region.—The low anticline of Artois, generally less than 600 feet high, forms no break between the Paris Basin and the similar Belgian Basin on the north-east. There is the same concentration on sugar-beet, wheat, and stall-fed cattle on the same *limon*-covered chalk, while farther north in Flanders are moister soils on which hops, flax, and other crops are added to the beet-sugar and cereals.

In the midst of this land of old-established, rich agriculture, the discovery of coal measures below the Cretaceous rocks led to the establishment in the nineteenth century of a large industrial district. The coalfield stretches from west to east in a narrow band, some six to ten miles wide, on the north of the Collines d'Artois, and extends eastwards across the Belgian frontier. It is thickly built upon by small mining and manufacturing towns which form a great industrial conurbation, with occasional centres of importance, such as Douai and Valenciennes. A considerable iron and steel industry has grown up here, including the manufacture of steam-engines and locomotives, but the principal industry is the textile, which is centred just north of the coalfield. This industry is an ancient one, originally based on the wool from sheep on the neighbouring chalk lands and from the Ardennes, and on the local flax for whose preparation the waters of the Lys have been famed since the Middle Ages. The old towns took a new lease of life with the discovery of the coalfield and new towns sprang up, so that there is now a large conurbation of over 600,000 people, with Lille (201,000), Roubaix (107,000), and Tourcoing (78,000) as nuclei, all occupied in the woollen, linen, and cotton industries. Armentières on the Lys specialises in linen. In addition to these industries there are important, though scattered, alimentary industries, preparing sugar, beer, butter, cheese, and chicory.

The region possesses an intricate system of canals, still in great use for carrying the bulky raw materials, coal, iron ore, wool, and cotton, to and from the coalfield, and linked to the coast at Calais, Gravelines, and Dunkerque. The latter, which is the chief port for the region, is an artificial creation.

The Armorican Massif.—The Armorican Massif is a low dissected peneplane never exceeding 1,400 feet in height and generally below 600 feet. The region consists of Pre-Cambrian and Palæozoic rocks which have undergone

two periods of folding, the first of which affected the Pre-Cambrian rocks and the second all rocks up to the late Palaeozoic measures. It seems that this area was never a highly contorted mountain mass such as the Alps, but experienced less intense folding, similar to that of the French and Swiss Jura. Consequently metamorphism was less intense, and many rocks, especially the shales, retain their original character. These shales form the lower ground, the higher ground generally being formed of granites and of hard metamorphic rock such as gneisses and quartzitic sandstones. In general the relief bears little relation to the structure, and although the higher land follows the direction of the strike, which is from east to west in the north and from south-east to north-west in the south, yet it corresponds to the harder rocks and not to one particular formation, nor to either anticlines or synclines. There are two main areas of broad uplands, the northern running eastwards from the Mts. d'Arrée (1,283 feet) in western Brittany to the hills of Alençon (1,368 feet), and a southerly line running parallel with the south coast to the Gâtine Hills of La Vendée, south of the Loire. Both uplands have many gaps, the southern line especially being discontinuous as well as seldom reaching above 600 feet. The land falls gently to the coastal or the interior lowlands on either hand, except in the west of Brittany, where the Montagnes Noires (1,069 feet) interpose a third zone of upland.

The Armorican Massif has often been compared to the south-western peninsula of England, although the latter is very much smaller. Both show the same rocky coasts, the same drowned estuaries, and the same low but accidented relief. The explanation is the same in both cases. After peneplanation both were partially submerged, but re-elevation brought about rejuvenation of the river systems with the result that the valleys, especially near the coast, are deep and narrow. Later submergence gave a drowned coast-line. In climate also the two regions are similar. With their large number of rain days and their mild winters, grass scarcely stops growing, and early spring vegetables and flowers are greatly favoured. Like Devon and Cornwall also, the area is a country of meadows, mixed cultivation and woodland in the lower lands, and of moors on the granites and on the higher regions generally. In the Armorican Massif, however, owing to the greater size there is more contrast between the coast-lands and the interior.

The Armorican Massif falls into three sections, the western peninsula or Brittany, the northern Cotentin peninsula in the old province of Normandy, and the southern area, already described, round the mouth of the Loire. Brittany in particular shows a well-marked individuality with its Celtic language and aloofness from the rest of France. The general poverty of the soil would suggest a scanty population, but, on the contrary, the density is above the average for France, though the coast-lands (Ar Mor) are much more thickly populated than the interior (Argoat). The coast-lands have the benefit of a milder climate and earlier spring for growing early vegetables, of cheap sea manures (seaweeds and crushed shells), and of greater opportunities for attracting tourists, in addition to their old fishing industries. The fisheries are mainly inshore on both coasts, but are otherwise different, the southern coast specialising in the sardine fishery, including the tinning of the fish in numbers of factories along the coast. The waters of the northern coast are generally too cold for sardines and the catch is various (turbot, conger, ray, mullet), while the fisherman and his family, in addition, usually cultivate a small plot of land. Paimpol specialises in lobsters, and like Binic and St. Malo sends ships to the Iceland and Newfoundland fisheries. The development of the early-vegetable industry was in response to the demand for such commodities from England, hence also the greater attention to this branch of agriculture on the north instead of the milder south coast.

The interior of Brittany and also the southern coast-lands have recently developed an important dairying industry, for which the interior basin of Châteaulin is especially noteworthy. Forage crops, to supplement the grass, are now being grown instead of the buckwheat and potatoes which were needed for human consumption in the days before the railway era, when Brittany was economically self-contained.

There are few large towns in Brittany. Brest (79,000) is of national importance owing to its naval dockyards, but although possessing a magnificent harbour it has not developed as a commercial port for various reasons, including the lack of industrial concentration in the interland, and the slowness of the railway journey cross the dissected Armorican massif. Rennes (99,000), in a fertile basin on the eastern edge of Brittany, is the chief commercial centre and the only university town.

The Cotentin peninsula is similar country to Brittany and has an important dairying industry. The change in the direction of the coast has caused the partial silting of the bay of St. Michel and the development of marshes along the west coast. These are absent from the short north coast, however, and in the twentieth century the port of Cherbourg has developed as one of the chief liner ports of France.

The Basin of Aquitaine (Le Bassin Aquitain).—The basin of Aquitaine forms a great triangular plain, bordered by the Pyrenees on the south, the Massif Central on the north-east, and the sea on the west, but connected by means of broad lowland corridors to the Paris basin and the Mediterranean coast. It is almost entirely agricultural, and has less variety of climate, hydrography, and soils than the Paris basin.

There is a much greater proportion of Tertiary deposits here than in the Paris basin. They reach to the coast on the west and to the Pyrenean folds on the south and continue also through the gate of Carcassonne into the lowlands of Languedoc. On the east the Tertiaries abut on to the old Silurian and granitic rocks of the south-western part of the Massif Central, and it is only in the north-east of the basin that the Cretaceous measures are found, stretching from the coast (Ile d'Oléron) south-eastwards nearly to the River Lot north of Cahors, while the Jurassic measures lie still farther to the north-east in a band stretching from the coast (Ile de Ré) south-eastwards to the River Aveyron. The Cretaceous measures are mainly, and the Jurassic measures almost wholly, formed of limestone, but the Tertiaries, unlike those of the Paris basin, mainly consist of clays and marls. The Cretaceous and Jurassic outcrops together form a belt of dry land on the north-east of the basin, while the Tertiaries have plenty of water and are generally more productive and more thickly peopled.

There are two exceptions, however, to the fertility of the Tertiary region, both occurring on the outer margins of the outcrop, namely the regions of the Lannemezan on the south and of the Landes on the west bordering the Bay of Biscay. In the first case the Tertiary rocks have been covered by immense fan-shaped scree (*cônes de déjection*) brought down in the Ice Age by glacial torrents from the high central Pyrenees. These thick deposits of gravel extend for fifty miles from south to north and

have now been divided into isolated plateaus by feeders of the Garonne and Adour. These valleys become flooded with the summer torrents, while the plateaus themselves are high (c. 2,000 feet), dry, and bare and afford only sheep pasture. Population is very scanty and mainly confined to the valley slopes, where maize forms the staple crop. The Landes region is a low, flat plain which has been invaded by wind-blown sand from the coastal dunes. The real mischief, however, is the presence at some depth of a band of impermeable rock (*alios*), caused by the cementing of the sand by an iron oxide, aided by humic acids produced by the decomposition of roots and plants. This prevented the water in the subsoil escaping, and aggravated the lack of surface drainage which was caused by the flat relief and by the fact that surface drainage is blocked seawards by the line of dunes, except for the Gulf of Arcachon. These dunes developed from a *cordon littoral*, which substituted a straight coastline for a former uneven one, the earlier bays becoming lagoons. In their original state the Landes were covered by dry sandy stretches alternating with swamp, the former giving pasture to a few sheep. Reclamation in the nineteenth century took the form of planting and fixing the coastal dunes, cutting drainage canals, and planting the interior with pine woods, which now cover half the total area. The pine trees utilise the water of the subsoil, help to lower the water-table, and provide some humus, in addition to their valuable immediate use for turpentine and timber.

The central part of the basin, however, is a great zone of rich agriculture. This lowland is traversed by the main river of the basin, the Garonne, which almost monopolises the drainage, though the Adour drains the south-west corner. The whole of the Garonne plain is devoted to agriculture, noted as much for its variety as for its richness. Cereals, especially wheat and to a less extent maize, orchards, cattle-rearing, and vineyards all flourish. Round the Garonne estuary, however, the cultivation of vines is almost a monoculture, the wines, particularly those of Médoc and Graves on the west of the river, being of good quality and widely exported through Bordeaux. Incidentally it may be noted that Bordeaux also *imports* considerable quantities of good wine from Languedoc, Algeria, and other places, and after suitable treatment these also acquire the name of "Bordeaux."

Bordeaux (258,000) is the largest town of the basin and

of ancient fame as a wine-exporting city. It is an old bridge town situated on tide-water sixty miles up the river on the left bank of the Garonne, the right bank being mainly composed of cliffs. Like the other ports of the western coast of France (La Rochelle, Nantes), it may be compared with our own port of Bristol, since it reached its apogee at the time of the great sugar, rum, and slave trade with the Gulf of Mexico before the nineteenth century, and then declined relatively owing to the absence of an industrial hinterland. Its recent revival is due to the attention given to the South American and West African trade, particularly the imports of wool and meat from the former and groundnuts from the latter. Besides wine, the chief export consists of pit props from the Landes. Pauillac has been developed as an outport and work has been begun at Verdon, just inside the Gironde estuary, on a new deep-water and liner port.

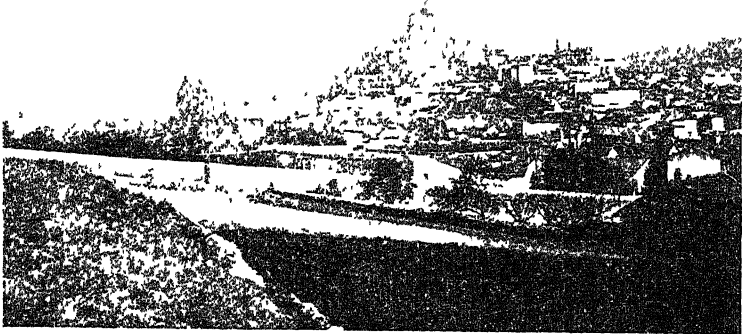
Also situated on the Garonne is the city of Toulouse. It should be noted that the basin of Aquitaine has no natural centre and that the two most important towns are on the margins. Toulouse was the ancient political and intellectual capital of southern France, and possesses a large university. In recent years, largely with the help of water power, it has developed iron and woollen industries, the iron-ore being obtained from the Pyrenees. Toulouse and its neighbourhood form the only manufacturing region in the whole of the basin of Aquitaine.

To the north-east of the fertile Tertiary deposits are a number of "pays" which are transitional to the Massif Central. Between the River Vezère and the River Aveyron on the Jurassic limestone are the karst-like plateaus, or Causses, of Quercy (1,300–2,000 feet). These plateaus are devoted almost exclusively to sheep-rearing, Rocamadour cheese being made from the milk. The deep, sheltered valleys, however, with their alluvium form rich, if limited, agricultural land, devoted to maize, vines, and other fruits. Périgord, on the Cretaceous chalk, shows rather the same contrast between dry uplands and moist, productive valleys, but the uplands are lower (c. 600–700 feet) and are partly cultivated, partly under sheep pasture, and partly under oak forest, in which the famous truffles (a subterranean fungus) are found. Its prehistoric "grottoes" of Cro-Magnon, La Madeleine, and Le Moustier along the River Vezère are caves and holes in the chalk.

North-west of Périgord the "pays" of La Petite

Champagne reveals its character in its name and is typical of the plains that accompany the River Charente from Angoulême westwards. The sides of the valley, however, produce excellent wines, which are made into brandy, named "cognac" after a small town on the river.

The Central Plateau (Le Massif Central).—This high triangular-shaped horst is not as centrally placed as its name implies, and as it is entirely surrounded by lower lands it forms less of an obstacle to movement than one might think at first sight. It attains an average height of about 3,000 feet, with an extreme elevation of a little over



[Courtesy French National Tourist Office.]

FIG 35—THE BASIN OF LE PUY, ON THE UPPER LOIRE

The volcanic "plug" on the left is surmounted by a church, that in the centre by a gigantic statue of the Virgin Mary.

6,000 feet. But the massif, though rather scantily populated, is by no means devoid of resources. It is deeply penetrated by the two tectonic depressions of the Allier and Upper Loire in the north, it possesses some mineral resources in a number of small coal basins, and even the plateau itself was long ago cleared of forest to provide pasture, and, in places, arable land.

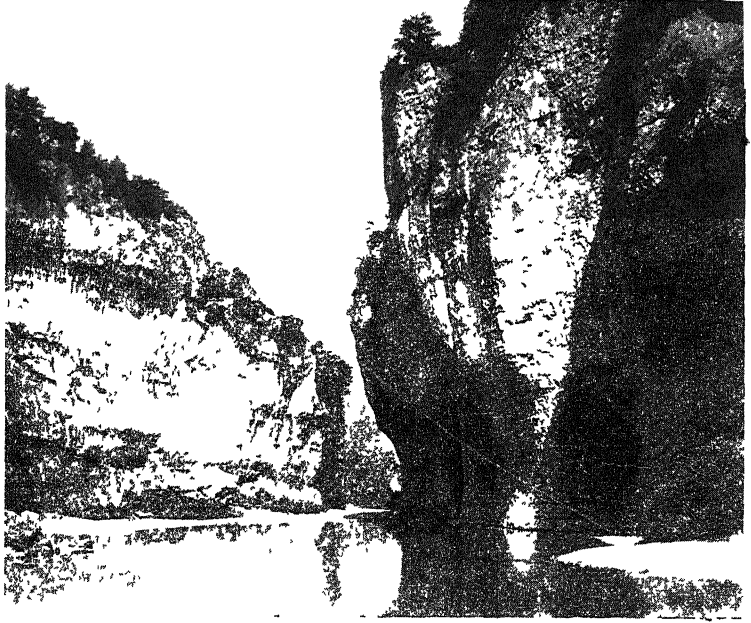
The rocks of the massif were folded in early Carboniferous times, the strike being north-west to south-east in the western half and north-east to south-west in the eastern half. The whole region proceeded to undergo the denudation which resulted in its reduction to a peneplane. In this peneplane granites and crystalline

schists predominated, and the coal measures, which had been deposited in lake-filled synclines after the folding had taken place, were in some cases preserved. It should be noted that the coal measures were never very extensive, and that they were subsequently often disturbed by volcanic intrusions, by lateral compression which threw them into folds, and by later faulting. Small wonder, then, that the coalfields of the Massif Central are small and the coal expensive to work. The Mesozoic era was a period of calm during which limestones were formed in the sea surrounding the island-massif, but in mid-Tertiary times the earth movements connected with the building of the Alps made their influence felt, and the massif was raised to a great height, especially in the south-east, where the high Cévennes Mountains now form the main watershed of the plateau. Included in this uplift were certain areas of Jurassic limestone, whose unfolded strata were raised *en bloc* to form the high plateaus of the Causses in the south and south-west of the massif. Extensive faulting also occurred, particularly in the north, where large segments of the plateau foundered and were covered by fresh-water lakes in the valleys of the Allier and Upper Loire. In connection with these lines of weakness was an active vulcanism, which continued into Quaternary times and raised up volcanoes and spread lava plateaus over the centre of the massif. The highest point of the massif to-day is formed by one of these volcanoes, the Puy de Sancy (6,186 feet), and though the Tertiary volcanoes are considerably weathered, those of the Chaîne des Puys, of Quaternary date, are extraordinarily well-preserved. The older lava plateaus have been weathered sufficiently long to cause extensive decomposition and now provide the most fertile soils of the massif. Apart from the volcanoes and the foundered zones, the plateau still retains its peneplane appearance, with rounded outlines and large areas of flat or undulating ground. The uplift, however, naturally caused a rejuvenation of the river system, and, particularly in the south where the uplift was greatest, the larger rivers have formed deep, narrow, and wild valleys, *e.g.* the Tarn and Lot, while short torrential streams have fretted the south-eastern edges of the plateau into mountainous forms. On the other hand, the north-western part, which was little uplifted, retains its senile shallow valleys.

It can be seen from the above brief summary of its

physical history that the massif is an area of considerable diversity, which is increased by differences in the relation of the various parts with the plains at their feet, and also by differences of climate, the southern border of the massif coming under the Mediterranean régime, and the whole of the western part being more oceanic than the eastern.

The massif can conveniently be divided into four sub-regions, eastern, central, southern, north-western.



[Courtesy French National Tourist Office.]

FIG. 36—VIEW IN THE GREAT GORGE OF THE TARN.

The eastern part of the massif, bordering the great highway of the Rhône-Saône valley and lying east of the Upper Loire, consists of an alternation of highlands and depressions, all orientated from north-east to south-west in the direction of the strike. This means that the area was open to penetration from both sides, and through routes, utilised by road, railway, and canal, traverse the depressions. The mountain masses from the Morvan in the north to the Vivarais in the south are generally composed of granite, possess rounded forms, and are regions of much bog and poor agriculture, though cattle-rearing and some cultivation of hardy crops such as rye

and buckwheat are carried on. Some patches of forest remain and the Vivarais still cultivates mulberry trees, though in decreasing quantities. The lower parts of the eastern slopes bordering the Saône-Rhône depression are devoted to vineyards, but north of Lyons these slopes are mainly formed of sediments belonging to the Saône basin. Population and activity is concentrated in the depressions of Le Creusot and St. Etienne, though industry has also invaded the highlands round the latter town. Both these depressions possess small coal basins, and Le Creusot (38,000) was actually the first place in France to use coke in smelting iron, the first blast-furnace of that kind being set up in 1782 by an Englishman. The Canal du Centre, built shortly afterwards between the Saône and Loire, was of great value to the industry before the railway era, but in the absence of iron and the shortage and expense of the coal, the industry only keeps going owing to its historic momentum and to its safe position, remote from a frontier, for the manufacture of armaments. The same remarks are true for the St. Etienne iron industry, and though there is a less acute shortage of coal, yet without the restrictions on imports Cardiff coal could undersell the local product, and did so in 1913 on these central coalfields themselves. The industry survives by concentrating on products needing a small amount of raw materials but considerable skill and experience, such as cutlery, small arms, and special steels. St. Etienne (190,000), however, has another industry, fostered by the silk merchants of Lyons, that of ribbon-making, formerly of silk alone, but now also of cotton and rayon. This industry has spread into the surrounding mountains, where it is often a home industry, though the looms are driven by hydro-electricity obtained from the Alps.

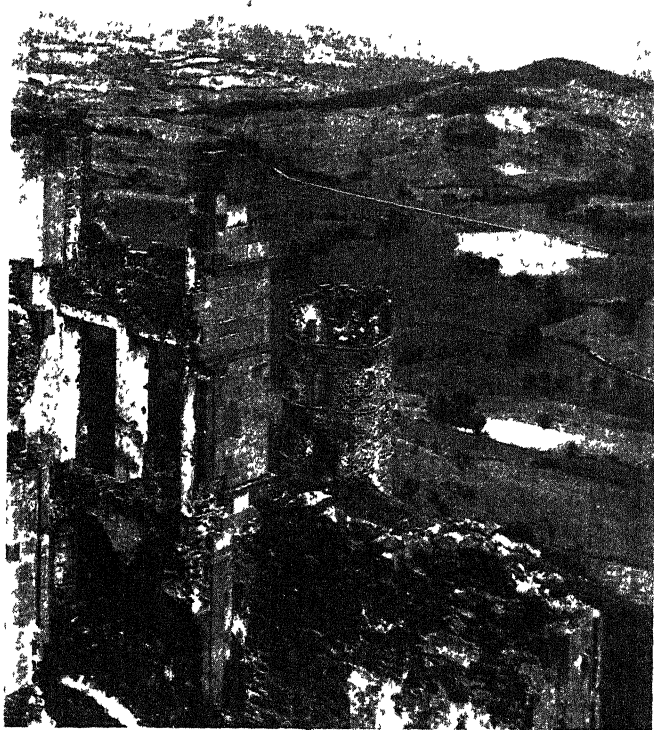
The centre of the massif includes the great tectonic depressions, the associated volcanic areas, and parts of the old crystalline plateau on which the volcanic deposits rest. Along the Upper Loire are three tectonic basins, but only the most southerly one, that of Le Puy, has really fertile soil, since this basin alone is surrounded by Tertiary volcanic outpourings. The remains of these deposits, which once filled the whole basin of Le Puy, form isolated stacks—often picturesquely crowned by churches (see Fig. 35)—and the columnar basalt "organ pipes" of Espaly (*cf.* Fingal's Cave, Staffa). The western part of the Allier depression also has fertile soil derived from

the volcanic region of the Auvergne, but the eastern part, with soils from the crystalline Mts. du Forez, is less productive. Vichy on the eastern border is noted for its thermal springs. Clermont Ferrand (101,000) on the western border, the second largest town of the massif, uses fruits of the plain and milk of the mountains to manufacture jams and chocolate, and the initiative of its inhabitants has led to the establishment of rubber manufactures, particularly motor tyres, and of motor car factories. The volcanic region of the Auvergne shows a great variety of volcanic forms in many stages of denudation. The Cantal and Mt. Dore are gigantic volcanoes eaten into by erosion, and the parts left upstanding are the actual *puys* or peaks, of which the Puy de Sancy (6,186 feet) is the highest mountain of the whole Hercynian zone of Europe. North of Mt. Dore and immediately west of Clermont Ferrand is the extraordinary landscape of the Chaîne des Puys, with sixty or more volcanoes stretching as far as the eye can see, mostly with beautifully preserved craters and lava streams. But it is the old lava plateaus, known as *planèzes*, round the older volcanoes which offer the good soil of the district, and these though bleak carry excellent pastures devoted to dairy cattle.

The southern part of the massif presents an alternation of crystalline and high limestone plateaus, which very seldom present a mountainous appearance, apart from the Montagne Noire and the Cévennes on the southern margin. The limestone plateaus known as "Causses" are renowned for the deep, cañon-like valleys cut by the Rivers Lot, Tarn, and their tributaries. The plateaus themselves exhibit all the usual karstic phenomena, including dolines, swallow holes, and underground streams. Economically the Causses are poor, though the aromatic herbage nourishes flocks of sheep, sheep's milk cheese (Roquefort) being made in the valleys. The similar but lower Causses of Quercy have already been mentioned in connection with the basin of Aquitaine.

The north-western part of the massif presents the most uniform appearance. The whole of this plateau of Limousin and Marche is a crystalline peneplane with poor soils and few resources. The higher parts of the plateau carry heath and some forest, the valleys are barely scooped out and are encumbered with alluvium and mainly swampy. Only sheep and store cattle can be reared and

these with difficulty, but towards the borders, where the effect of the rejuvenation of the river system has been felt, the valleys have a greater slope and when drained give good pasture for cattle. Western Limousin, west of Limoges, is sufficiently low-lying and penetrated by wide



[Courtesy French National Tourist Office]

FIG. 37.—VIEW IN THE PLATEAU OF AUVERGNE FROM CHATEAU À MUROLS

This view over high plateau pasture-lands, developed on volcanic soil, is typical of many in the "Mountains" of Auvergne.

valleys to be much warmer. Sweet chestnuts flourish and long afforded the staple food "crop" of the region. Limoges (95,000), noted for its porcelain made from china clay weathered from the local granite, is on the main route from Paris to Bordeaux, which here takes a short cut across the low north-western portion of the massif.

The Massif Central is one of the regions from which emigration to the richer parts of France has long taken place. A specialised form of this emigration was that of the famed companies of stone-masons who carried out work far afield in the Middle Ages ; they built, for instance, the cathedral at Uppsala in Sweden in the twelfth century. At the present time there is some seasonal migration to the vintages of the surrounding lowlands, but the spread of the railways in the nineteenth century allowed the people to abandon subsistence farming and to concentrate on cattle-rearing, for which most of the region is best suited. A great improvement in stature and physique has been noted during the last fifty or sixty years.

The Rhône-Saône Depression and the Mediterranean Coast.—This area of very varied relief consists of the Rhône-Saône corridor, the bordering mountains of the Alps and Jura on the east, and the Mediterranean coastlands of Provence to the east of the Rhône and of Languedoc to the west. The area may be looked upon as being mainly an elongated basin of sedimentation, with Tertiary deposits running from north to south down the long central axis, but the bordering Cretaceous and Jurassic measures on the east have been thrown into folds, while on the west their outcrop is not continuous, the Tertiaries in places coming directly against the old rocks of the Massif Central.

The Saône-Rhône corridor is particularly noted as a routeway from north to south and for the branch routes which strike off from it, though the waterway itself is neglected owing to the rapid flow of the Rhône, fed as it is from Alpine rivers, while the slow-moving Saône is used for local traffic only. Road and rail routes from the Paris basin and Lorraine converge across the Plateau de Langres to the head of the Saône depression, where the route from the Rhine rift valley (*via* the Belfort gap between the Vosges and Jura) also comes in. Important routes, though more difficult ones, lead from the Saône valley across the Jura to the Swiss plateau and thence across the Alps to Italy, while farther south is the Lyons-Mt. Cenis-Turin route directly across the Alps. The importance of these routes in connecting the busy well-populated regions of north-west Europe with the Mediterranean lands has already been emphasised.

The Saône-Rhône corridor, however, is more than a mere routeway, for it has considerable agricultural importance and also contains the most important silk-manufacturing

centre of Europe. Its agricultural importance is, however, limited by the narrowness of the corridor. The Saône plain above Lyons is the widest part, the Tertiary lowlands, extending here for some forty miles from east to west by 130 miles from north to south, whereas the Tertiaries of the Rhône valley, between Lyons and the gorge of Montélimar, have undergone considerable uplift and the present lowland consists of an alternation of small basins and narrows, which though some eighty miles long varies in width from about ten miles to practically nothing at all. Below the Montélimar gorge the highlands recede from the river, leaving a triangular-shaped plain whose Mediterranean climate causes its agriculture to differ in some ways from that of the rest of the corridor. Throughout the region, however, hot summers and early springs greatly favour plant growth, and allow a rich and diverse agriculture in spite of the fact that the soils are by no means always fertile. The Tertiaries themselves are sandy in places, but the worst soil is probably produced by the morainic material brought down by the former glaciers of the Rhône and Isère which reached the Rhône valley just above and below Lyons during the Great Ice Age. The marshes and lakes of La Dombes in the angle between the Saône and Rhône are developed on impermeable glacial clays.

The main agricultural wealth of the corridor lies in its vineyards, the most famous being those of the oolitic scarp of the Côte d'Or to the south-west of Dijon, where the renowned wines of Burgundy are produced, though in addition the whole of the lower outer slopes of the Massif Central overlooking the river produces wines of good repute, and less esteemed wines come from the plain itself. Dijon (96,000), the old capital of Burgundy, is the organising centre of the industry and also possesses alimentary industries, including the making of wine and of beer. Its importance as a route centre has already been noted.

At the other end of the Saône lowland, situated at the junction of Saône and Rhône, is the great city of Lyons (Fr., Lyon; 570,000), the third largest town in France. The city was made the capital of Gaul under the Romans owing to its nodal position at the convergence of the Rhône-Saône route with (a) the route between the Jura and the Alps leading to the Swiss plateau and (b) the routes westward across the narrow eastern highlands of

the Massif Central to the Loire. Its modern importance is due to its silk industry and banking organisation, but a detailed study of the growth of both reveals how much they owe to artificial fostering on the part of the French kings from the fifteenth century onwards. The raw material for the silk industry at first came from Italy, the Levant, and Spain, but the cultivation of the white mulberry, on whose leaves the silk-worms are nourished, gradually spread in southern France from the fourteenth century onwards, although raw silk continued to be imported. At the present day the greater part of the raw silk used is imported from Japan and Italy, the rearing of silk-worms having languished in France owing to the small remuneration it offers in spite of a state bounty. The highly organised industry maintains its world reputation largely owing to the experience, skill, and taste of the people engaged in it, especially to their fertility in bringing out new designs. In amount of silk used, however, the French silk industry has been surpassed by the American. As already mentioned, the industry has spread into the neighbouring mountains, particularly those of the Massif Central.

From Lyons southwards to the Montélimar gorge is the narrow, picturesque Rhône valley with its accompanying old castles and little towns. Large dams and power stations are here being built to tap the energy of the rapid, swirling river.

The French Jura.—Accompanying the Saône lowlands on the east is the highland region of the Jura, averaging some 3,000 feet and reaching to over 5,000 feet. This region presents the classic example of a simple type of folding, where practically every anticline forms a ridge and every syncline a depression, though it is only the eastern side, partly in Switzerland, which shows this type of country (*Jura plissé*), and in the central and north-western regions the rocks are unfolded though faulted, and plateaus have resulted (*Jura tabulaire*). A markedly individual river system has arisen in the folded portion, with sluggish longitudinal courses in the synclines and short rapid stretches where the rivers break through the anticlines in gorges (*chluses*). The alternation of ridges and valleys lends itself to a complicated system of river capture; the "incredible" course of the River Doubs with its abrupt hairpin bends presents one of the best examples of a river of this kind. Some of the longitudinal valleys

have no apparent outlet, but drain away through the Jurassic limestone which forms the greater part of the mountain system. The synclines often retain Cretaceous deposits, sometimes even Tertiaries, which are usually clayey and retentive of moisture, and bands of clays in the Jurassic series cause the occurrence of powerful springs. The Keuper marls of the Triassic system, sometimes denuded in the anticlines, and always present at depth, are also little permeable.

The Jura Mountains have a heavy precipitation and were originally mainly forested. Clearing has taken place wherever good pasture would result and the whole area has become an important dairying country, the cattle being turned on to the higher pastures in summer and stall-fed from the rich produce of the valley meadows in the winter. A good deal of forest still remains in the higher parts, and on the lower slopes, below 1,000 feet, vines are cultivated. Settlement is agglomerated in large villages and small towns, principally at the entrance of *cluses*, e.g. Pontarlier, Nantua, both on main international railway lines which insinuate themselves through the mountains along the synclines or cut in short tunnels through the anticlines. Besançon (65,000) on the Doubs, near its entrance to the Saône plain, is the main market town of the French Jura.

The French Alps of Savoy and Dauphiné.—The Alps border the Rhône Valley closely from Lyons southwards. Their outer folds (Préalpes), formed mainly of limestone, are known as autochthonous, in contrast to the transported material of the “nappes,” and have a north-south strike. (See Chapter XXIII.) They reach a height of over 6,000 feet, but are deeply penetrated by two great valleys, the Upper Rhône and the Isère. A good deal of river capture has taken place here, and before the Ice Age the Upper Rhône flowed northwards to Lake Geneva and along the depression between that lake and Lake Neuchâtel. Also the Isère, by cutting a deep longitudinal furrow in a band of soft Liassic rock, has beheaded the transverse valleys of the Lac du Bourget and the Lac d'Annecy, though the through routes remain, the former being used by the Paris-Mâcon-Mt. Cenis railway line. The Isère valley provides a very narrow but very fertile ribbon of agriculture almost into the heart of the Alps, and contains also a scattered industrial development especially for the manufacture of paper, aluminium, and carbide of calcium,

using hydro-electricity. Grenoble (96,000), at the junction of the Drac and Isère, is a route centre and a University town noted for its researches on hydro-electricity, and has considerable manufactures such as silk, gloves, paper.

The high inner French Alps which include the high crystalline massifs of Mont Blanc, Pelvoux, and Mercantour are little productive, but the fine scenery of the former attracts large numbers of tourists.

The main occupation of the Alps of Savoy (Fr., Savoie) and Dauphiné is the rearing of dairy cattle. Some forestry is also engaged in.

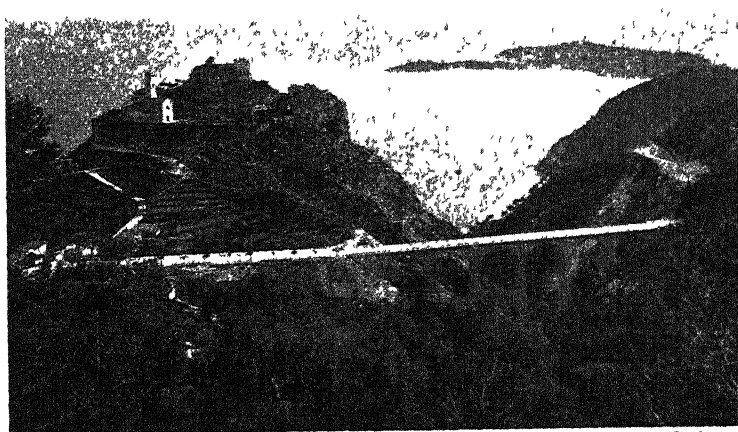
The Mediterranean Lands of France.—South of the Montélimar gorge begins the Mediterranean coastal region. The Rhône itself forms a delta owing to the tidelessness of the Mediterranean Sea, and there is no suitable site for a great port actually at the entrance of the great Rhône-Saône corridor. Marseilles is twenty-five miles to the east of the delta, away from the river-silt which is carried westward by a coastal current.

The region of Mediterranean France has a unity of climate, but in relief and structure the area shows many contrasts, there being marked differences between Provence on the east of the Rhône and Bas Languedoc on the west. The latter is mainly a lowland, but the former is a complex region of folded mountains and old massifs, together with basins and valleys. In the Alps of Provence two sets of folds have come in conflict with one another. The main strike, especially in the west, is from west to east, *i.e.* the same as that of the Pyrenees, and it is considered that these folds are older than the Alpine folds, which here are from north to south, and that they interfered with the development of the latter. Peneplanation seems to have been carried to an advanced stage, and the subsequent re-elevation has produced a great development of plateau forms in the limestone of which the mountains are largely composed.

These east-west folds are also visible to the west of the mountain zone though they only form low ridges standing a few hundred feet above the surrounding Tertiary plains, as in the case of Les Alpilles, north-east of Arles. Everywhere, however, the dry climate and the permeability of the rock produce only a thin growth of thorny or resinous plants, so that the southern Alps, unlike the northern, are good for sheep pasture only, and even in the low ridges the bare white limestone gleams through the scanty

vegetation. The consequent heavy weathering has given these hills a singularly rugged and mountainous appearance in spite of the low altitude.

The basins and plains to the east of the Rhône and north of the delta are highly cultivated, and often irrigated, mainly from the Durance. The cultures are extremely varied, but early vegetables have a considerable place, and are usually grown on the sunny side of thick cyprus



[Courtesy P. L. M. Railway.]

FIG. 38—EZE AND THE CAP FERRAT, SEEN FROM THE GRANDE CORNICHE ROAD

A typical piece of the Riviera coast. Note the village, perched on a hill for better defence in olden days, the terraced cultivation, and the obvious difficulty of constructing roads along the coast.

hedges, which are reinforced by bamboo fences, as a protection against the Mistral, a cold northerly wind which blows in winter and spring. This wind, whose name means "The Masterful," is merely the usual cold north-west wind which blows at the back of a cyclone, but its coldness is here intensified by the contrast between the warmth of the Mediterranean coasts and the cold of the mountains, and the wind is especially strong because the narrow Rhône valley acts as a flue or funnel. The

expression is often used locally for any rather strong wind regardless of its direction. Almonds, peaches, and other fruit trees are common, as well as vines. Avignon (59,000) is now mainly a centre for tourists who come for the sunshine and for the fine Roman and mediæval buildings of the Lower Rhône Valley. East of the main distributary of the Rhône is the region of La Crau, whose surface is covered with pebbles and boulders brought down by a former course of the Durance. The dry surface is still largely devoted to winter pasture for sheep which in summer are taken up to the Alps, but it has been partly reclaimed for olive growing and other cultivations. Immediately east of La Crau rises the low chain of the Estaque, at the western end of the rocky coast of Provence. West of Toulon and east of Nice the limestone Alps reach to the coast, but between these are the two crystalline masses of the Maures and the Estérel, separated and bordered on the landward side by depressions of softer (Permian and Triassic) rocks, which afford opportunities for cultivation and movement. The valley of the River Arc with its Tertiary sediments continues the line of the Argens depression. The coast is rich in harbours, but Marseilles is the only commercial port, Toulon being a naval base. The main resources of the Provençal coast are its sunshine and scenery and more particularly its accessibility to the people of north-western Europe, other parts of the Mediterranean coasts being equally endowed but suffering from remoteness. Cannes, Nice, Monte Carlo, Mentone, and many* smaller centres are too well known to need comment.

West of the main distributary of the Rhône is the silt-formed delta known as the Camargue, a salty and marshy area devoted mainly to cattle pasture. The more northerly drier parts have been reclaimed for vineyards and other cultivations, including rice. The plain of Lower Languedoc consists of an alternation of Tertiary lowlands with low limestone hills known as *garrigues*, the former being chiefly devoted to vineyards, partly irrigated, and the latter to olives and winter pasture for sheep. The quantity of wine produced here is large, but the quality only ordinary as a rule. Nîmes and Montpellier are old centres near the junction of garrigues and plain. The coast is an entire contrast to that of Provence as it is edged by a dune-crowned "cordon littoral" behind which are lagoons, now sometimes dry. Sète, formerly Cette, is a small artificial port, with a large export of wine.

Marseilles (Fr., Marseille ; 914,000) is the leading passenger port of France, and the leading port as regards value of merchandise, though it stands second to Havre in tonnage. Founded by the ancient Greeks, the city long played an important rôle in Mediterranean trade, but its modern prosperity dates from the revival of Mediterranean trade following the cutting of the Suez Canal in 1869. The imports are of raw materials, largely from the Orient, from Africa and South America, and include oilseeds and oil fruits, cereals, wool, silk, cotton, rubber, sugar, coffee. The exports are mainly of manufactured goods, including cotton and silk tissues, metal objects, vegetable oils, sugar, rubber goods. Considerable manufactures have grown up in the neighbourhood, including soap, originally made from local olive oil, silk tissues, flour, sugar, and other products manufactured from the imported raw material.

A canal (10½ feet deep) has been cut to connect Marseilles with the Rhône. It pierces the Estaque in a tunnel four and three-quarter miles long, and is part of a great scheme to improve the Rhône as a waterway.

The Pyrenees (French Section).—France possesses only the steep, narrow slopes of the Pyrenees north of the watershed, which for the most part forms the international frontier. The western and central Pyrenees receive abundant precipitation and their importance to France lies mainly in their supplies of water power. Some iron-ore is mined and there are a number of tourist centres. The tectonic basin of Roussillon at the eastern end of the Pyrenees lies in the region of Mediterranean climate. It is largely irrigated and grows a great variety of crops. (*See also* Chapter VII.)

Economic Summary.—France is primarily an agricultural country, but also has a fairly important world position as a manufacturer. Her modern industrial development was largely due to the early start obtained in the Industrial Revolution, consequent upon her proximity to England, her accumulations of capital, fair supplies of ~~coal~~, and relatively stable political organisation. At the present day France is hampered industrially by the fact that her supplies of coal are *only* moderate in quantity and are expensive to mine, the output in 1937 being about 44 million tons, or only two-thirds of the total amount of coal consumed in the country. Iron ore, however, is in superabundance and of the 38 million

tons mined in 1937, over 19 million tons were exported, while the export of pig iron and steel was also considerable. Owing to the acquisition of the Lorraine ores, France has been able to develop her iron industry very greatly, though in 1937 she held only fifth place as a world-producer of pig iron instead of the second place she held in 1932, Russia, Germany, and Great Britain having surpassed her during that period, while the United States continued to hold first place. Of other minerals, France is also fortunate in possessing, in the Department of Var in the southern Alps, the world's greatest deposits of bauxite, an ore from which aluminium is produced, and also possesses, in Alsace, very large deposits of potash salts, second only to those of Germany. The large amount of water power available in the Alps and Pyrenees is also a great asset.

Manufactured goods take the leading places in the export list, particularly silk textiles, which generally stand first, followed by chemical products, cotton textiles, metal goods, articles of clothing, pig iron and steel, motor-cars, woollen textiles, rubber articles, wine, and horticultural products.

The imports are mainly of coal, raw materials for her industries, colonial produce, and petroleum.

Agriculturally, France is almost self-sufficing in those foodstuffs which can be produced in temperate climates, and—with the aid of a protected home market—the country is one of Europe's chief producers of wheat, though the home requirements are not always covered. It is interesting to notice that although France is nearly twice the size of the British Isles (213,000 *v.* 122,000 square miles), yet the population is smaller in numbers (42 *v.* 49 million), and this in spite of the lower latitude and the larger proportion of the tillable land. Fifty-six per cent. of the total surface is cultivated, forests cover 19 per cent., rough pasture 11 per cent., and less than 15 per cent. is waste land. The standard of farming is high and holdings mainly small.

France has a considerable mercantile marine and has recently been making a bid to obtain a greater share of the world's passenger traffic. France stood seventh on the list as regards world shipping in 1937 and fifth in Europe, the total tonnage reaching 2,870,000 tons.

Like the other old-established countries, France, or rather the French, have large amounts of capital invested abroad, partly in the French Colonies.

REFERENCES

France, by H. Ormsby (London, 1931), gives a very detailed regional account and a detailed bibliography. P. Vidal de la Blache's *Tableau de la Géographie de la France* (Paris, 1908) is the classic work in French. L. de Launay's *Géologie de la France* (Paris, 1921) contains a good deal of material on the relation of the structure to relief.

The periodicals *Annales de Géographie* and *Terre, Air, Mer*, formerly *La Géographie*, contain many articles on the geography of France.

The maps of the Service Géographique de l'Armée correspond to those of the British Ordnance Survey. Of the series which are complete for the whole country, that on the scale of 1:200,000 is the most useful for giving a general idea of the various regions.

CHAPTER XI

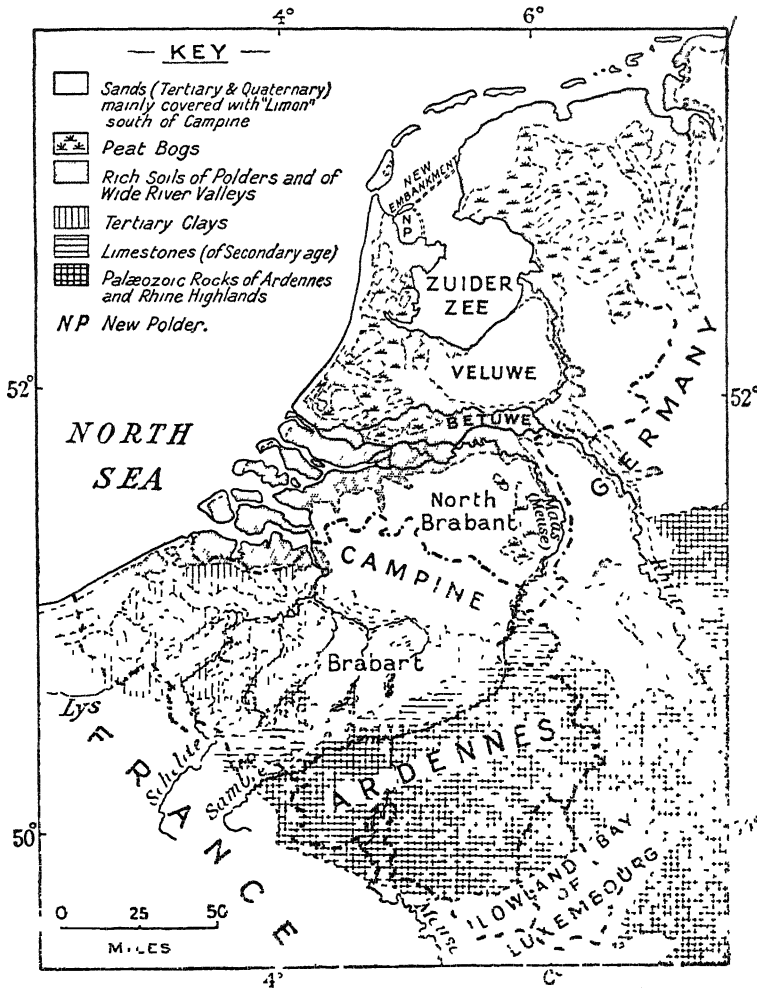
THE LOW COUNTRIES (BELGIUM AND HOLLAND)

BELGIUM and Holland have an interest and importance out of all proportion to their small size. The former, in the Middle Ages, showed the most precocious development of city life north of the Mediterranean zone, the earliest development of a great mediæval textile industry outside Mediterranean Europe, and later led the way in the Agricultural Revolution which spread over the continent. It was the first country to follow England in the Industrial Revolution and to-day is the most thickly populated country of Europe, with great manufactures and the most intensive agriculture of the continent. Holland has long attracted interest by its unrelenting struggle with the sea, a quarter of its surface being actually below sea-level. This effort to create land where none existed before is still going on, and the great project of reclaiming the Zuider Zee has been partly carried out (*see* Fig. 39). Holland's overseas possessions in the East Indies are an important witness to the country's former maritime supremacy. The position of both states at the junction of the Rhinelands and the sea has long given them commercial advantages of the greatest value.

A word as to nomenclature. The low-lying regions which the English now know as part of Holland and Belgium were formerly appropriately known as the "Low Countries." Nowadays only the northern section retains its title of the "Netherlands" (*Nederlanden*), which perhaps is just as well, since the Belgian state, created in 1839, mainly out of fragments of ancient Flanders, Brabant, and Luxembourg, includes a southern mountainous strip. The term Holland (=hollow land), however, properly only applies to one part of the *Nederlanden*, *i.e.* the part between the Maas (Meuse) estuary on the south and the Helder on the north, where the land is actually in a hollow below sea-level, with the North Sea on the west and the Zuider Zee (= "South Sea") on the east.

The countries are transitional between Central and

Western Europe. Culturally and climatically they belong to the west, structurally they belong mainly to Central Europe.



[After Demangeon.]

FIG. 39—GEOLOGICAL MAP OF THE NETHERLANDS AND BELGIUM.

BELGIUM

The Ardennes.—The southern portion of Belgium is occupied by the horst of the Ardennes, a western continuation of the Rhine Highlands, which stretch from

east-north-east to west-south-west following the direction of the strike. The highest part of the Ardennes lies near the south-eastern frontier of Belgium, and reaches nearly 2,000 feet. This, combined with the westerly position, gives the Ardennes a very heavy rainfall, and as the slates and greywacke, of which they are mainly composed, do not produce a fertile soil, the region is one of forests, moors, and cattle-pastures and is thinly populated.

North of the High Ardennes is the region of the Low or Sub-Ardennes where the same horst has been less elevated, and heights do not often exceed 1,000 feet. The climate is rather less severe than that of the High Ardennes, and the region possesses bands of limestone, usually covered with loam ("limon"), which provide stretches of arable country amidst the forests. The Meuse cuts a rather deep valley from south to north through both these zones to join the Sambre at Namur, whence it assumes the same direction as the latter river and flows parallel with the strike.

The Sambre-Meuse Depression and the Belgian Coal-field.—On the northern side of the old massif, and still partaking of its folded character, are the coal measures containing the productive coalfields of Belgium. The measures are continued from across the French frontier, and stretch eastwards from the coalfield of Mons to reach the Sambre valley near Charleroi, where they first outcrop on the surface. Thence the coal measures continue eastward, though only as a very narrow unproductive band along the Meuse valley, until they broaden out and once more become productive in the Liège district, after which the Meuse bends north and leaves the Ardennes region behind. The presence of coal at great depth has also been ascertained beneath the Belgian plain in the Campine region between Antwerp and the Meuse, and a good beginning has been made with its exploitation, but few manufactures have as yet developed there. From Mons to Liège, on the other hand, for a distance of some eighty miles, there is a great concentration of industrial development, the great iron, glass, zinc, and chemical industries of Belgium being situated on these coalfields; and even between the Charleroi and Liège fields, where hardly any coal is worked, it is brought on the canalised river to supply a considerable number of factories. The Belgian coalfield, like its continuation in France, suffers from contorted seams which make the coal difficult to work and therefore expensive;

the average output per man being only half the corresponding output in England and a sixth of that in the U.S.A., though the hours of work in Belgium are longer. Industry here, however, got an early start and has a good deal of historic momentum behind it, the first Belgian blast furnace to use coke being started (by an Englishman) as early as 1823, on the Liège coalfield at Seraing. At first local iron ore was used from the Carboniferous and Devonian limestones of the Lower Ardennes, but practically the whole of the iron ore now has to be imported. In the same way the zinc, formerly obtained near Moresnet, is now almost exhausted, but the industry remains owing to its historic momentum.

The industrial region is composed of a large number of towns and villages of small and medium size, though Liège with its suburbs numbers about 250,000 and Charleroi and its satellites is about the same size.

An isolated but important industrial region is situated to the east of Liège round Verviers in the valley of the Vesdre. This region already manufactured textiles before the days of power looms, the principal geographic factor being the pure streams for washing the wool and for supplying power for fulling. The first mechanical spinning frame for wool set up on the continent was erected here in 1798, again by an Englishman.

The Sambre-Meuse depression offers a route skirting the Ardennes and is used by the Paris-Cologne express. The valley itself, particularly below Namur, is about a mile wide and highly cultivated. Namur (32,000, with suburbs 45,000), an old route centre at the confluence of the Sambre and Meuse, has a certain amount of industrial development.

The Belgian Plain.—North of the industrial region of the Sambre-Meuse depression begins the Belgian plain of unfolded Secondary, Tertiary, and later deposits. It is drained principally by the River Schelde, which flows across Belgium in a north-easterly direction from its source in France towards its mouth in the Netherlands. The plain can be divided into three parts, first the *limon*-covered plain of middle Belgium centred on Brussels and comprising the old provinces of Brabant, Hainaut, and Hesbaye, secondly the sandy Campine which stretches to the north-east bordering the Dutch frontier, and thirdly the clayey and sandy plains of Flanders bordering the sea.

The Plain of Middle Belgium.—This slopes down gently northwards from a height of some 500 feet near the Sambre-Meuse depression towards the wide low-lying valley of the Schelde. It is traversed by a number of the Schelde's right-bank tributaries which form rather deep valleys cutting down to the Hercynian core in the south, but which become shallower farther north. It consists largely of Tertiary sands in Brabant, has considerable stretches of chalk in the south-east in Hesbaye and of clays in the south-west in Hainaut, but almost everywhere the solid deposits are masked by thick deposits of "limon," which gives the region a great uniformity. As in France the limon is the special domain of beet-sugar and cereals, especially wheat, but the agriculture is very varied and includes orchards and market gardens, and so intensive that the country is divided into minute, hedgeless fields, with a great deal of hand-labour bestowed upon them. There are practically no trees. In spite of the high density of population there is only one really large town, Brussels, (905,000 in 1936), the capital of the whole country and once the seat of the princes of Brabant, whose choice was the deciding factor of the city's growth at the expense of neighbouring centres, such as the similarly situated Louvain. The city is the chief commercial and intellectual centre of the country and also carries on a very varied industry, the necessary coal being brought by way of the Charleroi-Brussels canal, along whose banks many factories form an industrial link between the two conurbations.

Flanders.—Flanders is an historical entity rather than a geographical one, since it comprises two distinct regions of different soils and relief, firstly the flat maritime plain formed of clays deposited by a post-glacial invasion of the sea, and secondly the undulating, mainly sandy, plain which stretches south-east to include the valley of the Schelde. South of Ghent, however, the Schelde valley is crossed and the country partakes of the character of Brabant with stretches of limon. It is man, however, who has imposed a unity on this little area, principally by so improving the sandy soils of the interior that they are as productive as the naturally fertile clays of the maritime plain. The Flemings were able to do this owing to their discovery of the value of heavy manuring. This rose out of their desire to abolish the wasteful system of fallowing, in order to feed the large numbers of people in the mediæval industrial cities, who, in the days of difficult

transport, had to be supplied with food from the immediate neighbourhood. This leads back to the early development of city life in Flanders which is one of the unique features of the country. Bruges, Ypres, and Ghent, for instance, are known throughout the world for their mediæval monuments to civic pride, the "beffroi" of Bruges and that victim of the Great War, the shell-destroyed cloth-hall at Ypres, being particularly famous. There is no wholly satisfactory explanation for this burgeoning of city life, though geographically the country had the advantage of being situated at the meeting-place of three important river routes, along the Schelde, Meuse, and Rhine, and where these routes met the sea, whereas the Dutch were too pre-occupied in early days in fighting the sea to be able to take advantage of the commercial opportunities offered by a somewhat similar position. The great, but in mediæval times backward, land of England also provided a fine market just across the narrow seas for Flemish textiles and other goods, England afterwards supplying the raw material (wool), much in the same way that Africa now provides raw materials in exchange for England's manufactured goods. Of the historical aspect, including the enlightened legislation of certain of its rulers, this is not the appropriate place to speak, but when all the favourable factors have been displayed the fact remains that it was the quickness of the Flemings in seizing their opportunity that really counted, an opportunity which unfortunately for them soon passed. The great development of city life began in the twelfth century and decay set in at the beginning of the fifteenth century, partly owing to the silting up of the harbours and partly owing to political troubles.

The contribution to agriculture remained, however, and though the Flemings were not the only people in the world who discovered how to abolish the wasteful method of fallowing, yet it was from Flanders that the method spread to England and to other parts of Europe. The abolition of the fallow was combined with the growing of root crops as a winter feed for cattle, and the latter provided the manure necessary to restore the fertility to the soil, though sewage from the dense urban population and estuarine silt were also used. At the present day, manures of all kinds are employed, holdings are generally very tiny, many not exceeding half an acre, and cultivation is so intensive that the spade is commonly used instead of the

plough. The people now are usually poor and rather backward, clinging to old ways.

The variety of crops grown is great, *e.g.* cattle-feeds including root-crops, clover, and other forage crops, industrial cultivations such as beet sugar, chicory, and flax, cereals for cattle fodder and human consumption, though, as generally in western Europe, the area under cereals is decreasing. Dairy cattle and pigs are common in both areas. The two regions, however, have a totally different appearance, the flat maritime plain being quite treeless owing to the force of the sea winds, while the undulating interior plain is a country of trees, each field being surrounded by a row of trees useful for timber. It was on the basis of the home-grown flax that the Belgian linen industry grew up along the Lys tributary of the Schelde, the waters of the former river being renowned for their excellence for the retting process, which consists of steeping the flax stalks until the fibres separate. This textile succeeded wool in the sixteenth century when England had established a woollen textile industry of her own. At the present day it has been partly superseded by cotton, the earliest spinning-jenny on the continent for cotton being set up here in 1798. The linen industry, however, is greater than can be supplied in the country itself, and flax is also imported. The textile region of Flanders is centred in Ghent (164,000, with suburbs 230,000) at the junction of the Schelde and the Lys, and is spread through the Lys and Schelde lowlands in many smaller towns including Courtrai (41,000), Lockeren (24,000), Alost (41,000), St. Nicholas-Waes (42,000). The coast of Flanders offers no site for a large port; its ancient "cordon littoral," which once contained useful gaps, now being a practically continuous line of sand-dunes bordering the maritime plain. Ostend is a packet station and seaside resort, the old town of Bruges (52,000) is now connected by a ship canal, 26 feet deep, to Zeebrugge. A whole row of bathing resorts is found along the dune coast, which in all is only forty miles long.

The Campine.—This plain is an expanse of Pliocene and Quaternary sands and gravels brought down by the Meuse. It extends across the frontier into Holland and is a barren windswept area of heath and marsh in process of reclamation. Sand-dunes often occur, in places fixed by the planting of pine trees. In certain areas the region resembles the Landes of Aquitaine with the same impermeable "alios"

of ferruginous tufa at depth. The area is being reclaimed by the planting of pine trees (*Pinus sylvestris*), by the bringing of water in canals from the Meuse to irrigate the dry soil, by heavy manuring and the cultivation of nitrogenous crops. Root and forage crops, rye and oats are now considerably grown, and the dairying industry is well established, but the most highly cultivated region is round Antwerp which obtains here its supplies of market-garden produce.

The discovery of the Campine coalfield, first worked in 1917, is having the effect of introducing manufactures, *e.g.* of zinc and chemicals. The coalfield is at great depth, some 1,500 to 3,000 feet, but the reserves are estimated at nearly three times the amount of the old Belgian coalfield, *i.e.* about 8,000 million tons as against 3,000 million tons.

Antwerp.—This city of 273,000 people, or 480,000 with the suburbs, is the great port not only of Belgium but to some extent of the Rhinelands and north-eastern France also. It is situated fifty-three miles up the Schelde but is accessible even at low tide to large ocean-going vessels drawing 26 feet of water. Serving, as it does, one of the most populous regions of the earth, it imports, as one would expect, foodstuffs and raw materials, and exports manufactured goods. The new Liège-Antwerp canal should add to its importance.

Economic Summary.—Belgium is the most densely populated country of Europe with an average density of 707 per square mile, in spite of the fact that the thinly populated regions of the Ardennes and the Campine reduce the average. In Brabant the density reaches 1,386 per square mile. As the total land surface is small, only 11,752 square miles, the total population only amounts to 8 million, but even so the country must be looked upon as "overpopulated," and although the abundance of hands results in cheap labour which enables Belgian manufactures to be sold cheaply abroad, yet much abject poverty exists and even considerable illiteracy. A good deal of beautiful but miserably paid handwork, particularly embroidery, is carried on in Belgium, an exceptional survival in an industrialised country and bearing witness to the low standard of living.

The business language and that of the educated classes is French, to which Walloon, the language of the southern part of Belgium, has been assimilated. North of a line joining, roughly, Courtrai and Brussels, Flemish is widely

spoken, and of recent years after a good deal of agitation it has been placed on a parity with French in Flanders.

In spite of the intensive cultivation of the soil, Belgium has to import additional foodstuffs for its serried population, the main deficiency being in wheat, which holds first place among imports. The exports consist of manufactured goods, particularly of metallurgical products, plate and window glass, textiles, and chemical products.

Luxembourg.—The little state, known as the Grand-Duchy of Luxembourg, has since 1919 been within the Belgian Customs' Union. It lies partly in the Ardennes massif, but mainly in the scarplands which continue from France to form the lowland bay of Luxembourg. The Triassic and Lias series are here represented, the minette iron ore of the latter being present in considerable quantities. The quantity of iron ore mined in 1937 was 7,754,000 metric tons.

THE NETHERLANDS

The low-lying country of the Netherlands represents the western continuation of the Germano-Polish glaciated plain, apart from the tongue of South Limburg. It shows an alternation of reclaimed marsh with fen and poor sandy heaths, the former along the sea-coast and river valleys and the two latter generally farther inland. Three large rivers have their estuaries in the Netherlands, the Schelde, the Maas, and, most important of all, the Rhine, which also sends a distributary towards the Zuider Zee, and it is the presence of these great natural highways inland which gave and still gives the country its importance.

The same sequence of glacial and post-glacial oscillations of level took place here as in the German lowlands west of the Elbe and produced the same type of landscape and the same problems for man. (*See Chapter XIX.*) The glacial sands and gravels extend as far as the Rhine, and, south of this river, sand was widely spread by the swollen rivers of the Ice Age. Later the rivers cut broad shallow valleys, leaving the sandy tracts standing between them as low terraces, which only exceed 300 feet high in Veluwe north of Arnhem and generally range from sea-level to about 100 feet high. A negative movement of the land in relation to the sea caused these valleys to be flooded and marshes to form, while the formation of the Straits

of Dover allowed marine currents to sweep a sandbank, afterwards crowned with dunes, in front of the coast. Later this "cordon littoral" was penetrated by the sea, and divided into islands along the northern coast of Holland, though south of the Helder it is practically continuous as far as the Hook. Assaults of the sea, however, were resumed in historic times, especially in the late Middle Ages, and resulted in the loss of much land, principally by the formation of the Zuider Zee.

The Sandy Areas.—The Netherlands are the most densely populated country of Europe after Belgium, with a population density of 631 per square mile, yet the natural conditions were singularly unfavourable to man. The sandy and gravelly deposits of the interior (East Friesland, Drente, Groningen, Veluwe, North Brabant) are very poor in plant food. In many places the loose, white sand looks as unproductive as the sand of the seashore, and at best was a natural heathland and at worst, in Veluwe, was often piled into unstable sand-dunes, now planted with pine trees. In places, however, owing to the haphazard deposition of the glacial material and the consequent lack of drainage system, peat bogs were formed, especially north-east of the Zuider Zee in East Friesland, Drente, and Groningen. Exploitation of the bogs for peat has long been carried on, but their partial reclamation is a work only of the eighteenth century and onwards, drainage canals being cut, the peat being dug out, the top layer mixed with the underlying sand and the mixture heavily manured. The resultant soil gives excellent crops of potatoes, oats, and rye, and many kinds of vegetables. This type of reclamation, involving the creation of a complex drainage system, is a large-scale enterprise needing considerable capital and organisation, which have been supplied from various sources, such as the large towns, special societies, etc. On the other hand, the heathlands have been partly reclaimed in the course of centuries by peasant farmers, who kept a few sheep, a few beehives, and cultivated a little patch of rye or buckwheat. Nowadays modern methods of agriculture, including the growing of root-crops which do well in this light soil, enable cattle to be kept, though these are mainly stall-fed, and the manure is used to improve the land. Cattle and pigs, the latter partly fed on skim-milk, and poultry, have now become the dominant objects of farming on the heathlands.

The Areas of Rich Marshland.—An equal or even greater struggle took place to reclaim the swampy river plains and the coastal marshes, but such was the fertility of the muddy soil that it was seriously begun as early as the twelfth century. There are four areas of *polders*, that is of drained and dyked lowlands, in the Netherlands. Firstly, in Betuwe which includes the flood-plains of the Rhine distributaries and of the Maas, secondly the mud-flats of Zeeland, later transformed to islands and even mainland at the mouth of the Schelde and Maas, thirdly the tidal flats behind the line of dunes in Holland proper, and fourthly the mud flats bordering the sea in Friesland. Apart from Betuwe practically the whole of the polders

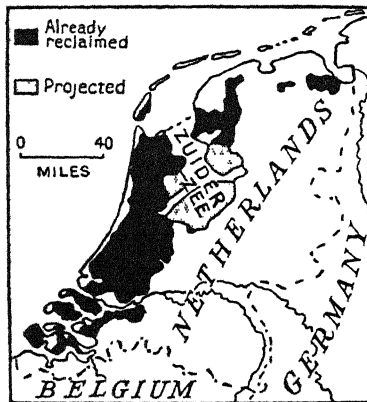


FIG 40.—LAND RECLAIMED FROM THE SEA IN THE NETHERLANDS

are below the level of high tide, and Betuwe is below the level of river floods, so that the reclaimed land has to be not only protected by dykes against tide and flood, but in many cases the water accumulated in the hollows has to be pumped up from the canals intersecting the polders to a sufficiently high level for it to be drained off to the sea or rivers, hence the large number of windmills in Holland, now largely replaced by power pumps. The more recently created polders, such as those on the sites of the interior lakes in Holland, the Haarlemmermeer and others, which were drained in the nineteenth century, are considerably below the level of low tide, and so also will be the projected polders of the Zuider Zee, where it is hoped in time to reclaim an area of 527,500 acres. The rich soil of the polders lends itself not only to fine pasture, but also to arable land, though dairy cattle are becoming increasingly the dominating interest. However, cereals, beet-sugar, tobacco, flax, vegetables, and other crops are grown, especially in Groningen and Zeeland. The bulbs of the Haarlem district of Holland are world famous, and Dutch vegetables find a market even in agricultural East Anglia. As in Denmark there exists in the Netherlands exceedingly good

methods of marketing the dairy and vegetable products abroad

Fishing is carried on from the Frisian Islands and Zeeland

There are no metallic ores in Holland, no oil, no water-power, and only in the present century has coal been discovered. The traditional fuel was dried peat. Coal occurs in the south-east of the Netherlands in Peel and Limburg. It is generally below 1,000 feet, often below 3,000 feet, but comes near the surface at Kerkrade and Heerlen in Limburg where it is worked.

Manufactures are hampered by the lack of motive-power and raw materials, and are concerned to a large extent with the working up of colonial produce from the Dutch colonies, *e.g.* margarine, cocoa, tobacco, especially in the ports, the construction of river boats and hydraulic machinery, especially along the Rhine, and the manufacture of cotton textiles in Groningen. The sandy region of North Brabant has recently developed a considerable and diverse manufacturing industry including electric lamps (*e.g.* at Eindhoven, 105,000¹), boots and shoes, tobacco, cocoa, and machinery of various kinds. The well-known diamond-cutting industry of Amsterdam is a comment on the wealth of the Netherlands as a result of its overseas trading ventures.

The Towns.—It is impossible to understand the urban life of the Netherlands without taking into account the fact that the towns are not dependent merely on this little country of some 13,000 square miles, but that their inhabitants derive their wealth also from centuries of sea trading, from an empire of 50 million people, and from the land transit trade to Germany. Hence the large size of the ports of Amsterdam and Rotterdam, the number of towns of medium size, and the number and importance of the university towns. Urban development is concentrated mainly in Holland itself, where a double sea frontage and the Rhine distributaries provided unique opportunities for the establishment of trading ports, even though the actual sites left much to be desired. Amsterdam (783,000) on an inlet of the shallow but sheltered Zuider Zee was already a great port at the end of the fourteenth century, but with the growth in the size of vessels a route had to be sought direct to the open sea. The North Holland Canal was used from 1815 to 1876,

¹ Population figures are estimates for 1937.

and the North Sea Canal from 1876 onwards. The latter, with a depth of 46 feet, reaches the sea at IJmuiden. The annual tonnage of shipping was 4·4 millions in 1931, the goods consisting mainly of colonial produce, especially from the Dutch East Indies for which Amsterdam is the great entrepôt. The suburbs, including Zaandam, have a large and very varied manufacturing industry, with flour milling, brewing, sugar-refining, cocoa and margarine manufacture, and many others. In addition Amsterdam is the great commercial and intellectual centre of the Netherlands. A number of towns lie on the eastward side of the line of sand-dunes, including Haarlem (133,000, with conurbation 150,000) and The Hague (Dutch, *s* Gravenhage; 487,000), the capital and royal residence, reputed the wealthiest town of the country owing mainly to the large numbers of business men who have settled here on retirement.

Most of the other towns are placed on the distributaries of the Rhine, and sometimes have decayed as the water channels have silted up, thus Utrecht (162,000) and Leiden (75,000), both university towns on the Old Rhine, were formerly of greater relative importance, but the northern distributaries of the Rhine have been abandoned progressively in favour of an ever-more southerly channel, owing to the increasing amplitude of the tides from north to south and the consequent increase in scouring action southwards. Although canals usually follow the old courses, the number of distributaries is now reduced to three:—the IJssel, which flows past Deventer to the Zuider Zee, officially being allowed 11 per cent. of the total water; the Neder Rijn or Lek, which flows past Arnhem (pop. 5,000) and Rotterdam, 22 per cent.; and the present main distributary, the Waal, flowing past Nimegen (pop. 2,000), 66 per cent.

The great port of Rotterdam (597,000) acquired its leading position only in the nineteenth century. The Lek, unfortunately for Rotterdam, splits up near its mouth into three channels, and Rotterdam is on the most northerly of these and therefore on the one which is being abandoned. (*See above.*) Only the cutting of a great artificial "Nieuwe Waterweg," begun in 1863, saved the port. To-day Rotterdam is one of the three greatest ports of the mainland of Europe, only Antwerp and Hamburg having a greater tonnage.

The Hook of Holland (Dutch, *Hoek van Holland*), at

the western end of the "new waterway," is a packet station towards England, and so is Flushing (Dutch, Vlissingen) on the island of Walcheren in Zeeland.

Apart from Holland and the Rhine-Meuse delta, towns are not well developed, Groningen (107,000) being the only large town of the north-east, and Tilburg (91,000) the largest of North Brabant, though in the latter province towns are growing rapidly. Zeeland has many small late-medieval towns, but the silting of the channels has hampered their growth.

Economic Summary.—A number of historical circumstances combined in the fifteenth and sixteenth centuries to render the Dutch conscious of the advantages of their geographical position, and having thrown off the Spanish yoke in the sixteenth century, they turned their attention to overseas trading, and in the seventeenth century were the leading maritime people in the world, though later eclipsed by England. As a heritage of these times the Dutch still possess important colonies in the East Indies (which provide overseas opportunities for many sons of Holland), and also the less important Dutch Guiana in South America; but the present large size of the country's trade is in part due to the development of the Ruhr coalfield in Germany in the nineteenth century and to the transit trade with the Rhinelands generally. The value per head of Dutch commerce is the highest in the world. The merchant fleet also revived during and after the Great War and now takes eighth place among the world's mercantile marine. It may here be noted that the Netherlands have never possessed the raw material for building ships, neither timber in the old days nor iron ore at the present day, but they were in a good position for importing timber from Germany *via* the Rhine and iron ore from Sweden.

As much as 70 per cent. of the total area is under cultivation, 21 per cent. is uncultivated (heath, water, etc.), and 7 per cent. is under forest. The only mineral of any importance is coal from the Limburg field. The output amounted to 14.3 million tons in 1937 as against only 2 million tons in 1913.

Apart from the transit trade the exports are mainly agricultural, and consist chiefly of dairy produce, vegetables, and flowers, but the specialised agriculture means that large quantities of cereals, especially wheat and maize, must be imported. Among other imports, timber, coal, textiles, iron, and steel goods take a high place.

REFERENCES

A Demangeon's *Belgique, Pays-Bas, Luxembourg* (Paris, 1927) gives a detailed regional account. R Blanchard's *La Flandre* (Paris, 1906) is a study of the Flemish plain in France, Belgium, and Holland. The first volume of H Pirenne's *Histoire de Belgique* (Brussels, 1902) gives a good account of mediæval industry, commerce, and agriculture in Flanders.

Of the official topographic maps, the series on a scale of 1 : 50,000 is perhaps the most useful for the Netherlands, and that on a scale of 1 : 40,000 for Belgium.

SECTION III—NORTHERN EUROPE

CHAPTER XII

GENERAL INTRODUCTION TO NORTHERN EUROPE

THE countries of Norway, Sweden, and Finland may be conveniently grouped together under the title of Fennoscandia. Although the region is probably more favourable to human habitation than any other area in the same latitudes ($55^{\circ} 22'$ to $71^{\circ} 15' N$), yet the traveller cannot but be impressed by the vast stretches of forest and *fjeld* (moorland) and the constant assertiveness of bare rock. A scanty human settlement is the natural consequence of the northern climate, high relief and much infertile soil, so that although the area of Norway is equal to that of the British Isles, its population is less than three millions, as against forty-nine millions for our own islands, while Finland, although considerably larger, has only three and a half million people, and even Sweden, with an area 50 per cent. greater than that of the British Isles, has a population of only six millions.

These figures indicate not only a small amount of farmland, but also an absence of any great industrial development, such as may lead to the growth of densely peopled manufacturing districts. Superficially, the statistics indicate certain affinities with Finland's neighbour Russia, whose vast northern spaces are equally scantily peopled, but in contrast to the general backwardness of Russia, the countries of Fennoscandia are highly developed. While it is true that Norway, Sweden, and Finland emerged from barbarism at a very late date compared with southern and western Europe, yet their outlook is to the west and south, and they have been in fairly close touch with the civilised life of the more southerly lands since their conversion to Christianity in the tenth, eleventh, and twelfth centuries. In many respects Norway, Sweden, and Finland may be looked upon as being ahead of the rest of Europe, especially in regard to education and

general culture and to such material matters as the widespread application of modern electrical devices.

It may be said, however, that to English eyes large areas of Fennoscandia bear a "colonial," "backwoods," or pioneer aspect, reminiscent, say, of Canada, and to a large extent this aspect is due to the same causes. Up to the Industrial Revolution, only the southern and coastal

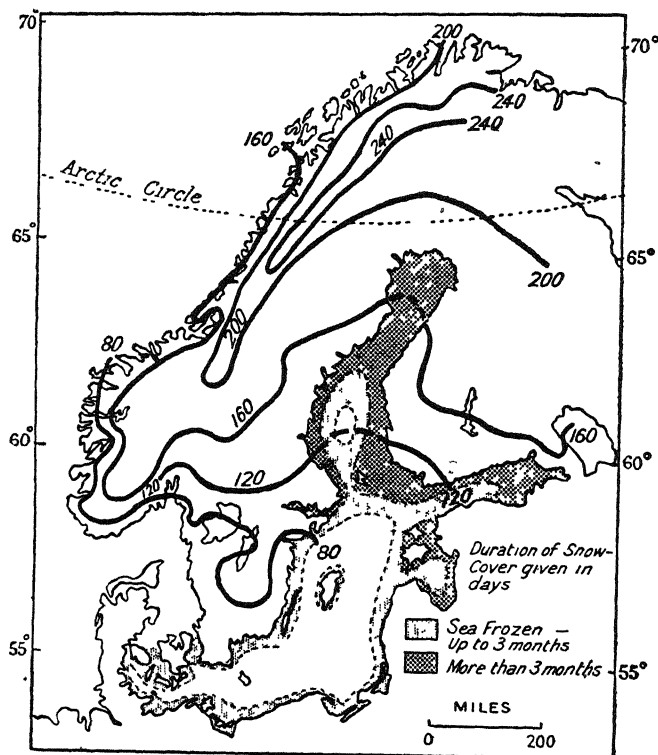


FIG 41—DURATION OF SNOW-COVER IN FENNOSCANDIA

regions of Fennoscandia were developed to any extent, and even there the population which the soil could carry was small. With the coming of a world demand for timber in the nineteenth century, however, Sweden and Finland discovered a use for their vast forested hinterlands, roughly north of 61° N., which they had been trying, with scant success, to colonise for the previous three centuries. There is, in particular, a strong likeness between Fennoscandia and the eastern part of Canada, a

likeness based on a fundamental similarity of structure and to a less extent on climate.

The absence of coal kept Fennoscandia aloof from the Industrial Revolution in the nineteenth century, but the recent development of hydro-electricity is leading

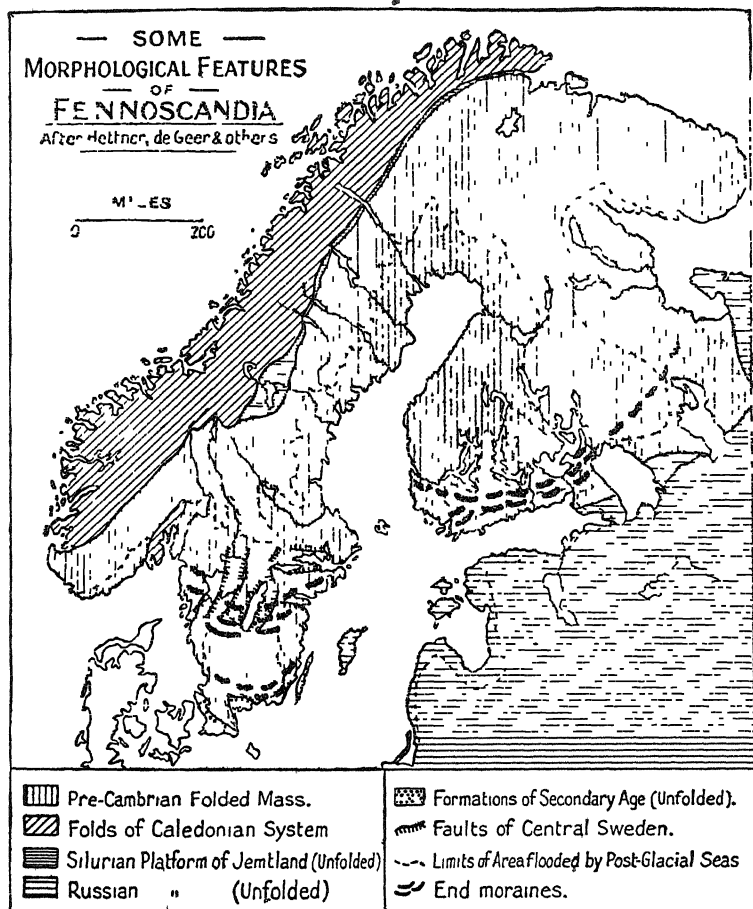


FIG 42—SOME MORPHOLOGICAL FEATURES OF FENNOSCANDIA

to an increase in industrialisation, and also is helping to conquer the "colonial" handicaps of great distances and small population.

Although the countries of Fennoscandia are broadly similar, yet there are certain divergencies in their dominant outlook. These differences may be explained to a large

extent by differences in position, as well as by certain contrasts in structure and relief which will be dealt with later on. The differences in position involve contrasts of climate and different contacts with other lands and peoples. For instance, the position of Norway with regard to the open ocean and to rich fishing grounds has given that country better opportunities for developing maritime activities than are possessed by Sweden or Finland, since the Baltic is poor in fish and hampered by ice in winter, though Sweden's North Sea coast gives her better opportunities than Finland in this respect. On the other hand, position combined with relief has given Sweden better opportunities for agricultural life than Norway, since in addition to wide lowlands, the climate is more favourable, being warmer in summer and always drier. Finland is less fortunately placed than either. In latitude she corresponds to the northern, less productive half of Sweden and has no ice-free coast, for even though the coast along the Arctic Ocean is little troubled by ice, it is too far removed from her populated areas to be of use except in the emergency of war. Moreover, the country must be looked upon as historically more backward than Norway or Sweden, her remoteness from the early cultural centres and her close connections with Russia in the nineteenth century hindering her cultural development.

Structure.—Fennoscandia consists fundamentally of an extremely ancient "shield" of Archæan or Pre-Cambrian rock representing the stumps of a mountain system that had already been peneplaned before Palæozoic times. This formation now appears at the surface in the whole of Finland, the mass of Sweden, and in most of the southern part of Norway, and underlies the rest of the area. On top of this ancient peneplane were spread sediments of later Pre-Cambrian, Cambrian, and Silurian age, which in the north-west of the region were folded in late Silurian times into another ancient, though relatively much younger, mountain system, belonging to what is known as the Caledonian system of folding. The name takes its origin from the Highlands of Scotland which belong to the same system. (See Chapter I.) This second mountain system stretches from north-east to south-west and forms the backbone of the present Scandinavian peninsula. Farther east the sediments remained unfolded and were denuded from Finland, eastern and southern Sweden, and southern

Norway during the long period of subaerial erosion which ensued. Where folded, however, the sediments were piled so thickly in a kind of trough in the Archæan platform that even the prolonged denudation, from Devonian times to the present day, has failed to remove them, though in places the Palæozoic deposits have been worn so thin that the underlying Archæan rocks are revealed through "windows." It is clear also that overthrust masses of the Caledonian system extended somewhat farther east than at the present day, as evidenced by outliers.

The Caledonian mountain range in its turn was reduced to a peneplane, and the present great elevation of the chain is due to epirogenic uplift, *i.e.* uplift *en masse*, in the Tertiary period.

Between the end of the Devonian period and the Tertiary rejuvenation, Fennoscandia was probably a land-mass, and at some time during this long interval there occurred the complicated system of faulting which forms a characteristic feature of the geology of the area, though the precise age is uncertain. This faulting has left little to show on the surface, though it is largely through down-faulting that vestiges of the former unfolded sedimentary Palæozoic cover of the eastern and southern parts of Fennoscandia have been preserved.

The Tertiary uplift gave the rivers new erosive power, but though the ancient peneplaned surfaces now stand at greater heights than formerly, the general evenness of the skyline betrays their essential nature. In the highest parts of the Norwegian *fjeld*, or high moors, the rivers still flow in wide open valleys, and this, combined with the gently undulating character of these plateaus, shows that the rivers have not yet had time to attack the central mass of the peneplane. The great valleys of Scandinavia, especially those of Sweden, seem obviously consequent to the strike of the Caledonian foldings, and this may be an ancient inheritance from the time when the mountain chain still existed, or may have been developed after the Tertiary uplift.

The Quaternary Ice Age is responsible for much of the detail of the present-day topography, and the disappearance of the ice-sheet is so recent that the glacial topography is still very little touched by subaerial weathering. There seem to have been at least two great glacial periods, since at least one long interglacial period can be proved. Scandinavia was one of the centres of dispersion of the

great northern ice-cap, and while almost all the phenomena connected with extensive ice action can be seen on the topographic map, the main result on the area, as far as human exploitation is concerned, was the removal of soil. It is true that a thin and patchy deposit of morainic material was left behind as the glacial cap retreated, and in the lower levels there are patches of ground moraine seamed with eskers (Swedish, *as*, plural *øser*), but the morainic material is only suitable for forest growth, not for agriculture, and almost all the fertile land is composed of post-glacial sediments, mainly clays, which were spread

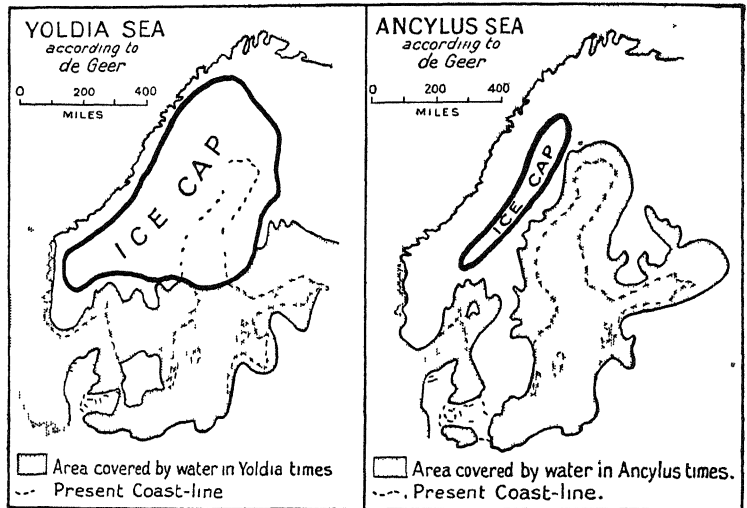


FIG 43—(a) YOLDIA SEA (b) ANCYLUS SEA.

over the lowlands as a result of an extension of the Baltic in geologically recent times.

At the close of the Ice Age a negative movement of the land with regard to the sea caused the coast-lands of Finland, Sweden, and southern Norway to disappear under the waves (The southern shoreline of the Baltic was but little affected.) The enlarged Baltic, called by geologists the Yoldia Sea, from the fossils of a mollusc *Yoldia arctica*, extended also right across central Sweden in the region of the present lakes Vener, Vetter, and Malar, thus communicating with the Skager Rak and North Sea. The central part of southern Sweden, however, now known as Småland, remained above water as an island. A slight

positive movement, particularly in the region of central Sweden, put an end to the broad channel mentioned above, which communicated with the Skager Rak, and turned the Baltic into a fresh-water lake, known as the Ancylus Sea, named after the mollusc *Ancylus fluviatilis*. This lake, though smaller than the Yoldia Sea, was larger than the present Baltic and still covered the coast-lands of Finland and Sweden, but only overflow channels allowed the drainage of water by the Skager Rak. This stage was followed by the opening of the Danish Straits which caused the sea once more to become salt, and there was a gradual recovery of land to present conditions.

REFERENCES

The Baltic Region, by E. G. Woods (London, 1932), gives an account of Finland, Sweden, and Denmark, mainly from the physical point of view. *Etats Scandinaves, Régions Polaires Boréales*, by M. Zimmermann (Paris, 1933), in the *Géographie Universelle* series, devotes about half its space to Fennoscandia. The periodical *Geografiska Annaler* contains articles in English and German, as well as in Swedish, on various aspects of the physical geography of Scandinavia. "Fennoskandia," in the *Handbuch der Regionalen Geologie* (1913-14), deals with the geology. The scope of G. Braun's *Die Nordische Staaten. Eine sozialogische Landerkunde* (Breslau, 1924) is indicated by its title.

CHAPTER XIII

FINLAND

A POPULATION map of Finland, such as that given in the official Atlas of Finland, shows a striking concentration of people on the coastal regions, particularly those bordering the Gulf of Finland. Indeed, the northern half of the country may be looked upon as unpopulated, while



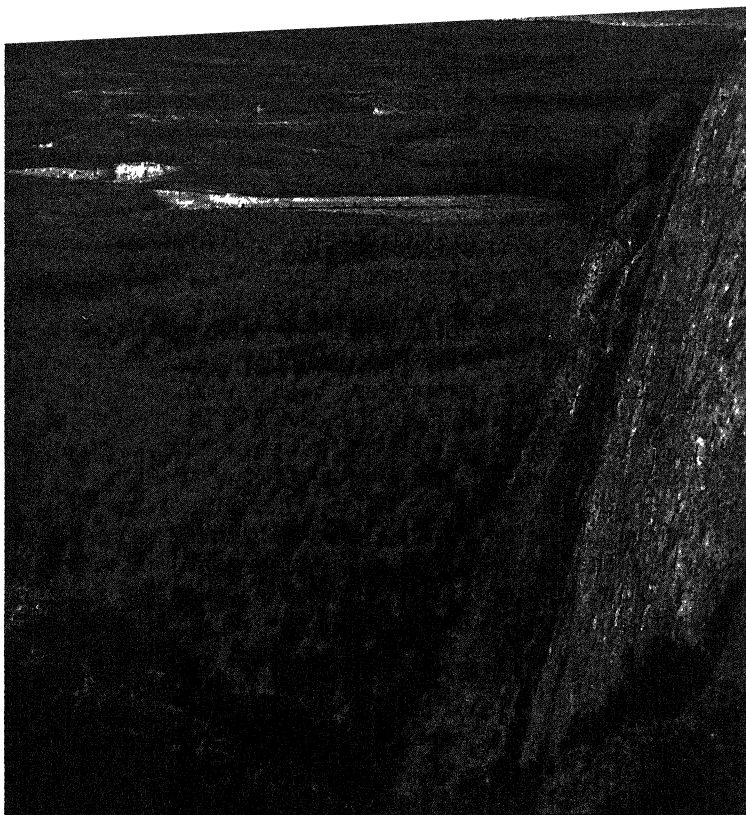
[Courtesy "Finland Travel

FIG 44 —HELSINKI (HELSINGFORS) FROM THE AIR

even in the southern half the interior carries only a scanty settlement. It may be noted here that Finland lies in the latitudes of Alaska and southern Greenland, and that Helsinki, which lies just north of latitude 60° N., is the most northerly capital city in the world, apart from Reykjavik in Iceland. The scanty population, then, is largely explicable on climatic grounds, but the nature of the soil adds to the inhospitable nature of the country.

Finland lies almost entirely on the Pre-Cambrian or Baltic Shield, and consists of a peneplane of highly folded and faulted rocks of metamorphic crystalline character,

together with intrusive igneous rocks, mainly granites. The ancient folds have no influence on the topography, and even the system of faults appears to be devoid of



[Courtesy "Finland Travel"]

FIG 45 —FINLAND'S ARCTIC FORESTS IN THE PETSAMO AREA

significance for the landscape, but the more resistant rocks, such as the gneisses, form the low, broad swellings which give the sole diversification of relief, apart from the

superficial glacial phenomena. The Quaternary ice-cap in its advance swept the rocks bare of soil, and the material deposited by the retreating glacier, consisting mainly of gravel and boulders scattered sporadically, was unsuitable for agriculture. In consequence there is very little land suitable of cultivation, except in the coastal belt with its post-glacial marine sediments.

Although the whole country has a low relief, there is a certain amount of contrast between the physiognomy of the northern section of Finland, say north of 64° N., and the land to the south. South of that line we find the well-known Finnish landscape with its myriads of lakes and its chaotic river system. North of that parallel of latitude the river system is well defined and the land rises eastward from the Gulf of Bothnia up to a line of hills, known as the Maan Selka, which reach a height of over 1,000 feet in places. Little is known of this range, whose forested wastes pass into the tundra of Finnish Lapland, while even the broad forested coastal lowlands carry only enough people to bring the density up to 10 per square mile. A motor road has been recently opened through northern Finland to Petsamo on the Arctic Ocean.

Apart from this northern area, the rest of the country falls naturally into the lake plateau and the coastal zone.

The Lake Plateau is bordered both on the east and the west by low heights which branch off from the Maan Selka. On the south, however, it is shut in by a rampart of a different nature. Instead of a low swelling of the Baltic Shield, there is the steep, though not very high, wall of one of the best defined end-moraines in the world, known as the Salpausselka. This end-moraine, which in places forms a double wall, runs in a great arc parallel with the coast, at a distance of some forty miles inland. Within these low walls occurs the type of landscape which gave Finland its native name of *Suomi*, meaning "Lakeland" or "Swampland." Actually lakes cover about an eighth of the total surface of Finland and there are said to be sixty thousand of them. These lake hollows appear to have been actually gouged out of the solid rock by the great Quaternary glaciation, though their island-studded, branching character betrays the presence of eskers and morainic material. In many places the lakes have been transformed into swamps, and occasionally the process has gone still further, so that the soil has been sufficiently drained for agriculture, mainly

101 pasture. This hummocky, lake-and-forest-covered surface, interspersed with patches of bare rock and occasional clearings, gives the characteristic Finnish landscape. Seen from a slight eminence which enables the spectator to look over the tree tops, the skyline has the long even lines that betray the peneplane character of the area, which the accidented detail of the country tends to make one forget.

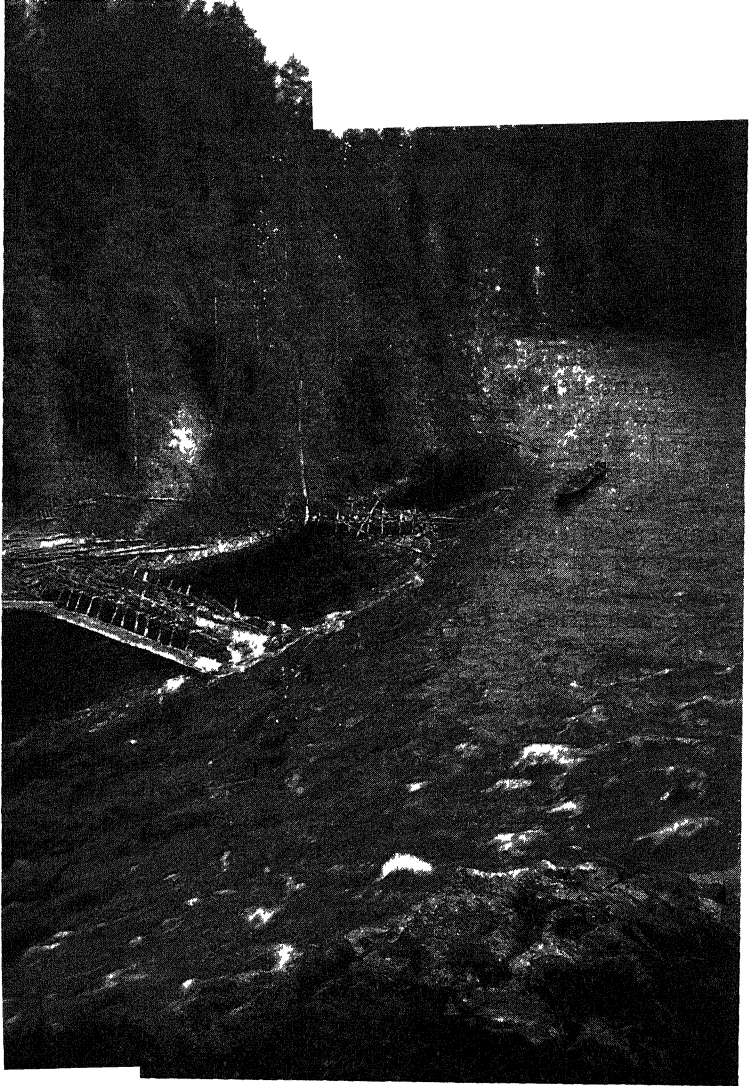
The water of the Finnish lake zone escapes by means of a few large rivers through the Salpausselka, generally by means of rapids, such as the Imatra rapids on the Vuoxen River draining to Lake Ladoga, or the "force" at Tammerfors (Tampere) in the west. Tampere (population 61,000)¹ is one of the few towns of any size in the interior of Finland, almost all the others being on the coast.

The Coastal Belt of Finland, especially in the south, has the advantages of better soil, better climate, and better access to the sea than the rest of the country. Originally covered with mixed forest, its marine clays provide reasonably good soils, though even here the stony heritage of the Ice Age is much in evidence. Climate and the cheapness of imported foodstuffs cause agricultural concentration on fodder crops, such as roots, hay, and oats. The dairy industry is important here as in the other Baltic countries. The shortness of the growing season is the greatest climatic handicap to agriculture, even in southern Finland. Summer is reckoned as beginning on June 24, when the rain is supposed to stop. In the middle of June the country still has a wintry aspect and crocuses are in flower. By the middle of July everything is in full bloom, and the meadow grass, abounding with scabious and other sweet-scented flowers, is ready for cutting. August is the season for collecting wild berries, such as raspberries, which owing to the severity of the winter are the only cheap fruit. Summer ends in early September and rain resumes until November, when the snow comes and conditions once more become pleasant. Winter is the visiting season, and the time for cutting the timber and dragging it over the snow to the frozen rivers, ready to be transported on the spring floods.

The coastal towns, Viipuri (Swedish, Viborg; 73,000), Helsinki (Swedish, Helsingfors; 284,000), and Turku (Åbo; 71,000), handle the great timber exports and manufacture

¹ Population figures are estimates for 1936.

timber products, such as wood-pulp and paper, using hydro-electric power. Other manufactures are little developed, though textiles are manufactured in and near



[Courtesy 'Finland Travel']

FIG 46—OULUJOKI RIVER, FINLAND

Typical of many rivers used for floating timber in Fennoscandia and Northern Russia. Note the logs and the log slides on the left

Turku, Helsinki, and Tampere Helsinki is the capital city and a university town

Historical and Economic Summary.—Finland was conquered by the Swedes in the twelfth century, but retained its autonomy The Swedes brought Christianity and may be looked upon as the chief civilising influence here, and many Swedes settled in the coastal belt, Åbo being the old capital under the Swedish régime. With the decline of Sweden as a great power Finland came under the rule of the Russian crown in 1809, but gradually lost the autonomy that had been promised After the Great War of 1914–18 it obtained its independence.

Almost the whole wealth of modern Finland is yielded by its forests, mainly of pine and fir, which cover three-quarters of the land surface. Ninety per cent of the exports consist of forestry products, timber, pulp, paper, etc., the remaining 10 per cent. consisting chiefly of butter. The country has a favourable balance of trade, in spite of the need of importing grain (and other types of foodstuffs), and many kinds of manufactured goods, such as textiles and machinery. The timber export trade is, however, threatened by the export of cheap timber from Russia, which has much vaster resources and is prepared to export at uneconomic prices.

REFERENCES

Atlas of Finland, 1925 (Helsinki, 1929), and *L'Agriculture de la Finlande en Diagrammes et Cartes* (1925) are two excellent official publications See also E Nordenskiöld's "Finland, the Land and the People" in the *Geographical Review*, Vol VII, 1919, and *The Finland Year Book*, Helsinki, 1937

The best topographic map is that on the scale of 1 100,000

CHAPTER XIV

SWEDEN

FROM the point of view of settlement, Sweden falls naturally into two main areas. To the north of the Dal valleys lies the new "colonial" area of Sweden, though a few of the settlements date back to the fifteenth century, while to the south is the old settled countryside. The contrast is based on differences of climate, relief, and soils, the southern part being far more favourable to human habitation. Lying mainly to the north of latitude 61° N., northern Sweden may be looked upon as a land of forests and mines, a producer of raw materials, while southern Sweden is a land of farms and towns, of commerce and industry.

Northern Sweden corresponds in latitude to Finland north of the southern coast zone, and lies therefore north of the belt of mixed forest whose boundary runs just to the north of the Dal valleys. The severity of the climate, particularly the absence of light in the long dark winter, is a great handicap to development. For instance, it is difficult to get workers to stay for any length of time in the iron workings of Gellivaara and Kirunavaara, though this is an extreme case.

Structure and relief are both unfavourable to settlement except in very restricted areas. From the mountains of the Norwegian border the land slopes down to the Baltic Sea, usually in a series of steps. The mountains of the frontier region belong to the Caledonian system of folds and raise their wastes of *fjeld*, rock, snow, and tundra above the tree line. The overthrust masses of folded rocks here often overlie unfolded Silurian measures on the east and usually form an eastward-facing scarp. From the foot of the Caledonian system, roughly at a height of 1,500 feet, the old peneplane surface, mainly developed on Archæan rocks, slopes down towards the south-east. The Tertiary rejuvenation has caused the rivers to cut into their beds, thus dividing the old peneplane into a number of isolated blocks. The presence of a long lake in the course of each river, roughly at the junction of the

Caledonian mountain system with the Baltic Shield, produces a "glint line" which is sufficiently remarkable to call for some explanation. It seems likely that the lake basins were formed at a time when the retreating ice sheet lay to the east of the watershed. The melt-water is supposed to have been caught between the ice barrier on the east and the mountains on the west and to have escaped westwards across the mountains by overflow channels. The lakes are of importance in the human geography of northern Sweden, as their drained portions

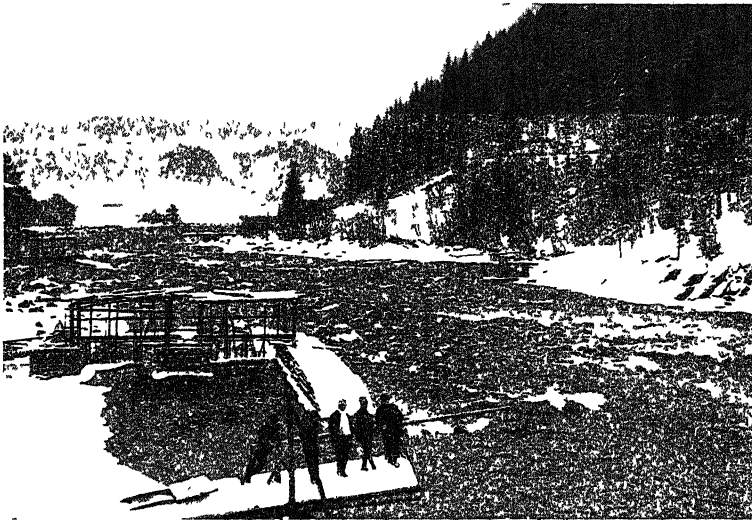


Photo *Lärte Norberg.*

[Courtesy Swedish Travel Bureau]

FIG 47—VIEW OF ÅNGERMAN RIVER NEAR SOLLEFTEÅ

Note the terrace with habitations and clearings in the distance

and terraces offer better soil for cultivation than the surrounding land.

The mass of this dissected peneplane is covered only with an uneven deposit of coarse morainic material, unsuited to cultivation and mainly covered with a dense growth of coniferous forest. Many lakes exist besides those already mentioned, some being small rock basins, others being dammed by morainic material, and others which combine both of these features.

To the south-east of this infertile forest belt lie the alluvial sediments deposited in the Yoldia Sea and its successors. This strip is naturally of uneven width.

extending deeply up the valleys and being much restricted elsewhere. The rivers have already begun to cut into these sediments owing to the lowering of the base-level, and have left broad, flat terraces of fertile soil, which are suitable for settlement and cultivation, and which have the further advantage of being near the sea. Conditions here are thus broadly similar to those in the Finnish coastal belt bordering the Gulf of Bothnia, and there is the same concentration of population, though the density is nowhere high. Sten de Geer's population maps of Sweden on the unit dot method give an excellent picture of the distribution of population.

A "fall-line" at or near the junction of the crystalline rock with the overlying recent sediments provides a useful source of power, which is used in the saw-mills of the coast.

The whole prosperity of northern Sweden at the present day is based on the exploitation of its forests. The Baltic timber industry assumed large dimensions only after the Napoleonic Wars, although the trade in "naval stores" goes back much further. At first the saw-mills were at the fall-line and used crude water-power, but with the development of steam-engines English coal was imported and the mills moved down to the coast. The more recent development of hydro-electricity has restored the falls to importance, though the mills have not shifted inland, owing to the greater ease of floating unhewn logs than of moving sawn timber or manufactured goods. The coast region gets the benefit therefore, not only from its own agriculture, but also as the manufacturer and exporter of the resources of the hinterland, and the latter industries are now more important than the former.

The iron ore resources of northern Sweden are as restricted in area as those of the forest are dispersed. These ores occur in Lapland north of the Arctic Circle. The best known deposits are those of Kirunavaara and Gellivaara, but other considerable deposits exist. As a rule the ores are more or less intimately connected with rocks which are either definitely or probably eruptive, and the ore-bodies are now generally looked upon as magmatic segregations. The most important deposits are found in hill ranges (the crests of which sometimes consist of very high-grade ore), owing to the fact that these masses of dense magnetite resist atmospheric disintegration better than the surrounding rock. The word *vaara* is a Lapp word meaning "hilltop." The ore is mainly

phosphoric and therefore was of little use before the invention of the Thomas and Gilchrist method of smelting. The iron-content varies, but in the ores now being worked it is above 60 per cent. and must therefore be classed among the richest in the world.

Owing to the unfavourable position of these mines and the expense of maintaining workers in such an isolated northern region, the ore is exported to other parts of Sweden or to other countries in order to be manufactured. Export was begun as recently as 1892, but was handicapped



[Courtesy Swedish Travel Bureau]

IRON-ORE WORKINGS AT KIRUNAVAARA, LAPLAND

The photograph was taken during a winter's day and shows work in progress.

until the completion in 1902 of the railway to the Norwegian port of Narvik, which gave the ore an ice-free harbour.

Apart from the coastal belt and the Lapland mining area, one other region of northern Sweden deserves special mention, *i.e.* Jemtland, in the upper and middle basins of the Indals Elf (*Elf*=river). Here a wide band of unfolded Silurian material has been preserved through faulting, and gives relatively fertile soil. Its importance is enhanced by a through-route, which is now followed by a railway, connecting the valley with the fertile depression round the Trondhjem Fjord.

Central and Southern Sweden.—The heart of Sweden is the lakeland that stretches between the Baltic and the Skager Rak. The navigable waters of the lakes and the connecting rivers were useful in providing easy links between the two coasts, especially before the days of railways. The importance of this area is emphasised by the presence, at either end of the depression, of the two largest towns of Sweden, namely Stockholm¹ (544,000), which is twice as large as any other city of Fennoscandia, and Goteborg (263,000), which is the third largest city of Fennoscandia.

In southern Sweden the population is densest along the coasts, as is characteristic of Fennoscandia, though the coastal belt here is broader than usual. In the centre of this southern peninsula is a pole of dispersion, consisting of the rocky uplands of Småland, which stood above the waters of the Yoldia Sea, and which reproduce to a less severe extent the conditions of the Archæan slope of northern Sweden. In the extreme south-west of the southern peninsula is the region of Skåne, which belongs geologically to central Europe and which agriculturally is the most productive lowland of Fennoscandia.

Transitional between northern Sweden and the central lakeland is the basin of the Dal River and the uplands surrounding it. This area belongs physically to northern Sweden in many respects, yet its lower altitude and lower latitude, the Silurian measures round Lake Siljan and the presence of minerals in the bordering uplands early attracted settlers. The mining belt lies mainly in the uplands separating the Dal River system from the central lakeland, but has an extension north of the Dal also. The only mineral mined in important quantities at the present day is iron, and although a variety of other metalliferous ores exist in small quantities, even the famous copper mines round Falun have now been abandoned. The iron ore is both phosphoric and non-phosphoric. The latter, associated mainly with Dannemora, provides the material for much of the world's finest steel work, and is both used in the country and exported, especially to Sheffield. It was the high quality of this ore that laid the foundations of Sweden's mediæval fame as an iron worker. The phosphoric ores, associated mainly with Grangesborg, are present in larger quantities, but were of no consequence until recent years. (See section on minette ores of Lorraine, p. 134.)

¹ Population figures are estimates for 1937.

The central Swedish lakeland presents a landscape rich in variation, in spite of the absence of great heights. The area is a mosaic of faulted basins, now mainly filled with marine clays or morainic material, where they are not still covered by water and swamp. There remain low horsts of the ancient crystalline rock which stand up above the surrounding landscape, and as these are useless for cultivation they have been allowed to remain covered with coniferous forests. Eskers are also numerous and are also forest-covered, and so too are the coarse morainic deposits.



FIG 49—VIEW IN THE COASTAL PLAIN OF SWEDEN

Agricultural land on post-glacial marine clays, forest on Archæan bosses and on morainic material. Similar views are frequent in the coastal plains of Finland.

Even in this favoured part of Sweden it was not an easy matter to bring the land under cultivation, since swamps had to be drained, forest cleared, and in many cases stones removed from the ground. The resulting landscape of lake and forest, meadow and moorland, arable land and orchard, is one of great diversification and charm.

Lake Mälär may be looked upon as the historic core of Sweden. The old royal residences of Sigtuna and Uppsala have given place to Stockholm as the modern capital, sometimes called "The Venice of the North." Situated on islands and on both banks of the narrows connecting

Lake Malar with the Baltic, Stockholm was a bridge town controlling the most important north-and-south routes of Sweden, as well as being at the eastern terminal of the great east-and-west water route. Its position near the branching of the Baltic into the gulfs of Finland and Bothnia made it a good base from which to control the whole of the Baltic lands.

The second largest town of Sweden, Göteborg, has surpassed Stockholm as a seaport, partly because it faces the open North Sea instead of the enclosed and ice-hampered Baltic, and partly because it is accessible to large ocean-going ships, which are unable to reach Stockholm. Situated at the mouth of the River Gota, it lies at the western end of the sea to sea water-route *via* river, lake, and canal, and though this route is of little importance to-day, yet it indicates the extensive hinterland of the port. The famous falls of Trollhattan, on the Gota River, are caused by a resistant block of gneiss. They operate a great hydro-electric power station.

The manufactures of the country are scattered throughout central Sweden, though southern Sweden also has a small share, but there is no great concentration of manufacturing conurbations in central Sweden such as is found in the countries possessing large coalfields. The modern industries were mainly developed from local handicrafts which grew up where there was water-power and a local demand. The use of imported coal as motive power in the mid-eighteenth century led to the coastal situation of the newer industries such as cotton, mainly manufactured in and round Göteborg, where also the raw material was imported, but the recent development of hydro-electricity as the chief source of power means that industry can remain dispersed and that there will be no "Black Country."

In consequence of the dispersion of manufactures it is somewhat difficult to associate them with the names of towns, though Eskilstuna (37,000) is noted as the "Sheffield" of Sweden, Norrköping (68,000) is noted for its woollen industry, founded over two hundred years ago by Gustavus Adolphus, Göteborg for cotton, and Jönköping (34,000), enclosed by the forested uplands of Småland, for timber and iron goods, the latter based on the iron ore of the Taberg.

Southern Sweden presents a different structure from central Sweden. The middle of the peninsula is occupied

by the barren uplands of Småland, with granitic and gneissic rocks appearing at the surface. The picture presented is similar to that of Norrland, with moorland and forest predominating, but owing to the more favourable latitude some agriculture is carried on and the population is denser. Surrounding this upland lies the totally different landscape of the coastlands, with their fertile lowlands covered by marine clays, and with a correspondingly denser population. On the North Sea coast the population is notably denser than on the Baltic coast, owing to the addition of fishing as a means of livelihood, resultant on the nearness of rich fishing-grounds.

The densest population of all, however, about 270 per square mile, occurs in the rectangular peninsula of Skåne. The rock formations here include strata ranging from the Archæan to the Cretaceous, which are brought into juxtaposition with each other by means of a series of faults, striking from north-west to south-east. Little indication of the solid geology appears on the surface, however, apart from low swellings of gneiss which rise above the surrounding plain. The whole region is covered with a thick mantle of fertile boulder-clay and is highly cultivated. The fertile soil and southerly latitude allow even wheat and sugar-beet to be successfully grown. The string of towns along the coast includes Malmö (144,000), a considerable port at the Swedish end of the train-ferry from Copenhagen, while Trälleborg holds the corresponding position in regard to the train-ferry from Germany. Lund (26,000) is an inland centre and university town.

Economic Summary.—Fifty-three per cent. of the total land surface of Sweden is forest-covered, so that forest products naturally occupy a high place both among the manufactures and the exports. The trees are mainly conifers, and are very largely utilised for pulp and paper. Only 9 per cent. of the land is cultivated, and the country is not self-sufficing in regard to foodstuffs, especially cereals, though there is some export of dairy produce. The large iron resources not only supply the home market but give a large surplus for export; for instance, 9 million tons out of the total 11 million tons mined annually are usually exported and Sweden comes second in Europe as an exporter of this ore, France being first.

The development of manufacturing for export is very recent, apart from the timber trade. For instance, it was not until 1912 that the exports of iron and steel goods

surpassed the imports of those commodities in value. Sweden is still not self-supporting as regards textiles, though becoming increasingly so. Owing to the high level of wages and the restricted home market, Sweden can compete on the world market only in "speciality" produce, with the one great exception of timber and its products. Besides wood-pulp, paper, furniture, joinery, and matches, Sweden exports such specialised products as those of the electro-chemical and electro-technical industries, together with labour-saving devices such as cream-separators, telephones, and ball-bearings. The imports consist chiefly of textiles and yarns, machinery and metal goods, coal, petroleum, colonial produce, and cereals.

REFERENCES

Sweden Historical and Statistical Handbook, edited by J. Guinchard (2nd ed., 2 vols., Stockholm, 1914), contains much information on the economic development, but is now somewhat out of date. Sten de Geer's *Befolkningens Fördelning i Sverige* (Stockholm, 1919) is accompanied by a map on a scale of 1 : 500,000 showing the distribution of population, forests, industries, etc., and has an explanation in English. H. W. Ahlmann's "The Economic Geography of Swedish Norrland" in *Geografiska Annaler* (1921) gives an excellent account. See also W. Credner's *Landschaft und Wirtschaft in Schweden* (Breslau, 1926). *The Sweden Year Book* (in English) contains much varied information and includes photographs and diagrams.

The most useful topographic maps are those on the scale of 1 : 100,000.

CHAPTER XV

NORWAY

NORWAY is at a disadvantage compared with Sweden both as regards latitude and relief. Whereas the southern tip of Sweden is in the latitude of Newcastle, the southern tip of Norway is in the latitude of Inverness, and whereas the broad southern part of Sweden is occupied mainly by a wide, productive lowland, the broad southern part of Norway is occupied mainly by a high, barren plateau, while the narrow northern "tail" is almost wholly mountainous. The average density of population of twenty-three per square mile is lower even than in Finland and is actually the lowest in Europe, apart from Iceland. The interior of Norway is generally so mountainous that the population is almost entirely coastal, especially from the North Cape, $71^{\circ} 15' N$, to Stavanger, $58^{\circ} 58' N$. Only on the more gentle south-eastward drainage slope of Norway, from Stavanger eastwards to the Swedish frontier, does the population spread inland in a belt of any considerable width, and it is here that the bulk of the population is to be found.

As far north as the latitude of Trondhjem the drainage of Norway is in two opposed directions from the great plateau-like *fjelds*. On the southern side the rivers flow to the Skager Rak and on the northern in a west-north-west direction to the Atlantic. North of that latitude Norway consists of only a narrow strip of land draining to the Atlantic, the watershed forming the frontier with Sweden. Although this narrow northern strip of Norway can be sub-divided still further, yet in a work on Europe as a whole it will suffice to consider it as a single region. The broad peninsular head of Norway, on the other hand, is sufficiently important and varied to demand sub-division, and three regions may be recognised, the interior *fjelds*, the south-eastern slope, and the western coast of the great fjords.

The Interior Fjelds.—These great *fjelds* or high moors consist morphologically of peneplaned surfaces uplifted in Tertiary times and since attacked with renewed vigour

by the agents of denudation. The *fjelds* are developed mainly on the rocks of the Caledonian foldings, but also on those of the Archæan system, so that it is evident that the age of the formations is of little importance for the present topography. In places mountains rise above the general peneplane level, and these owe their existence either to the great resistance to weathering of the rocks which compose them or else they are remains of an older and higher peneplane surface (*cf.* the peneplane surfaces in the Carpathians, Chapter XXVIII). For instance, the Snehätta Peak (7,544 feet) of the Dovrefjeld is developed in hard Archæan gneiss, while Glittertind and Galdhopig (the highest mountains of Scandinavia, 8,140 feet and 7,998 feet respectively) on the Jötenfjeld are developed in gabbro, a heavy basic eruptive rock of great resistance and of an age contemporary with the Caledonian folding. These great peaks show Alpine topography, owing to the fact that as residual mountains they stood above the ice sheet like the *nunataks* of Greenland at the present day, and they accordingly developed cirques, sharp ridges, and the angular forms characteristic of such mountains. Alpine types are, however, quite exceptional, and usually the mountains form rounded bosses, similar to those of other high, denuded peneplanes, *e.g.* the Highlands of Scotland.

The cycle of erosion is still so youthful that there remain considerable areas of upraised peneplane which have scarcely been attacked by the deepening of the river beds which has taken place in the lower and middle courses. Accordingly the high *fjelds* still retain the shallow valleys and meandering streams which date back to the days before the Tertiary uplift (*cf.* the Plateau de Mille Vaches in the Massif Central of France, Chapter X). The margins of the *fjelds*, on the contrary, have been intricately dissected by U-shaped valleys, and as in the case of the Highlands of Scotland or the mountains of Wales, it is often difficult to recognise the existence of the former peneplane surface, though it is betrayed by the even skyline and uniform heights of the mountains.

The *fjelds* rise above the tree limit, which is here at a height of about 2,000 feet, and although there is a good deal of grazing for cattle in the short summer, yet the highest *fjelds* carry only a tundra-like vegetation, which was useless until the very recent introduction of the reindeer industry from Lapland. Considerable ice fields

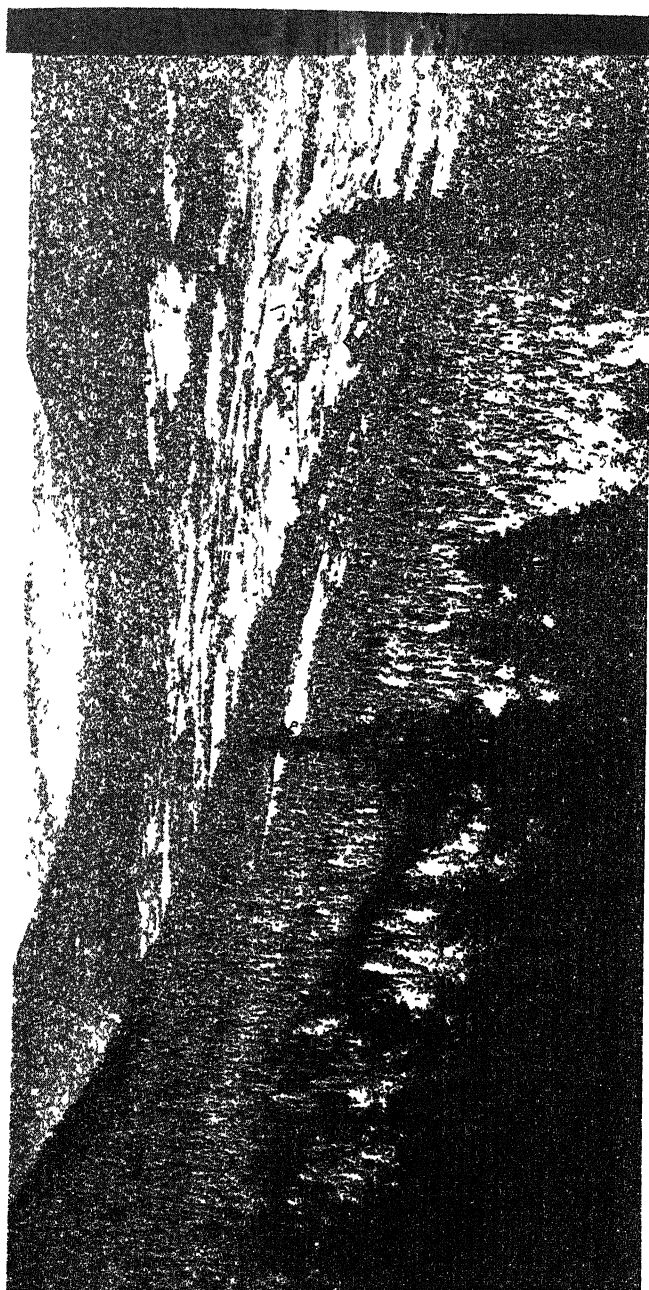


FIG 50 —RENDALEN FROM HANESTADKJØLEN
A valley of the "Eastern Slope" of Norway, but broader than many. Note the even skyline and the prevalence of forest,
also the glacial step and lateral shelf of the main valley
[Courtesy Norwegian State Railways]

are present in the highest *fjelds*, but great valley glaciers are few.

The South-Eastern Slope.—The south-eastern slope of Norway, which drains to the Skager Rak from the Hardanger Fjeld, the Jotun Fjeld, and the Dovre Fjeld, bears a marked structural resemblance to northern Sweden. Both slope in the same direction from the heights of the Caledonian fold system, *via* the Baltic Shield, to the coastal sediments deposited by the sea in post-glacial times. Similar rivers, in their trough valleys of glacial origin, are accompanied by similar lakes, and there is a similar sporadic covering of morainic material. The south-eastern slope of Norway is more favourable to mankind than the similar slope north of the Dal River in Sweden, owing partly to the more southerly latitude, partly to the extensive down-faulted area in the Oslo region, and partly to the fact that it drains to ice-free ports and to a sea rich in fish. The population is therefore considerably greater than in the morphologically similar strip in Sweden, even though the altitude is often higher in Norway.

Even in this favoured part of Norway, however, conditions are distinctly adverse to agriculture. Woods or forests form the background to every scene and many farmers engage in forestry in the winter months. Indeed, the mass of Norway's forest wealth comes from the slopes between the *fjelds* and the lowlands of the south-east coast, for the west coast is usually too steep and wind-swept for much timber, though trees occur on the slopes of the inner fjords.

The Oslo region is the most favourable part of Norway for agriculture. This area has a rift valley structure and is separated from the Archæan region on the east by a marked fault-escarpment and from the Archæan rocks on the west by heights formed of igneous rocks, associated with faulting. The Oslo region is also largely block-faulted within itself, and in such a manner that there is no large area of fertile ground even here, and patches of agricultural land alternate with forested or unproductive areas. Owing to the damp climate and short summer the arable land is mainly devoted to hay, though oats, barley, and potatoes are of some importance. Dairying is the most important branch of agriculture.

Oslo (253,000),¹ the capital, lies at the head of the sea-

¹ Population figures are from the 1930 Census.

filled rift of the Christiania Fjord and is situated not only in the best agricultural region of Norway, but also in the only area of Norway that has any degree of centrality. The great through-valleys of Gudbrandsdal and the Glommen focus here and give the only easy through-routes from coast to coast. The great rivers of these valleys both rise in flat, indeterminate watersheds which give easy saddles across the *fjelds* and lead down to the short valleys descending to the fjords of the western coast. It is reasonable to suppose that the through valleys were



[Courtesy Norwegian State Railways]

FIG 51 —VIEW OF SURROUNDINGS OF LAKE MJOSA

This view in the "Eastern Slope" of Norway shows the close juxtaposition of tillable valley and forested heights. The grain in the foreground has been placed on wooden supports for drying purposes, a method adopted in many areas having a wet autumn, *e g* in the Swiss Alps.

formed by heavy ice erosion during the Great Ice Age. The lie of the Scandinavian relief was against the path of ice currents from the Baltic centre of dispersal, so that ice streams over-rode the watershed, linked up valleys which had previously drained in opposite directions, and sometimes lowered the waterparting between them to such an extent that a low saddle resulted.

The chief development of manufacturing industries has taken place in the lowlands bordering the Christiania Fjord and the Skager Rak. The factories are chiefly

concerned with the working-up of timber and dairy products. The electro-chemical industry produces such commodities as calcium carbide, nitrates from the air, and aluminium. The canning of fish, especially brisling, is carried on extensively at Stavanger (47,000), though Hangesund is the chief centre of the south-coast herring fishery.

The Great Fjords.—Controversy has raged over the origin of the Norwegian fjords and skerry-guard. It may be mentioned here that in Norwegian the word "fjord" has no precise structural significance, but has much the same meaning as the Scottish word "loch," and the name is applied somewhat loosely to any kind of sea inlet whether the banks are low or high. It has, however, become the custom among geologists and geographers to restrict the word "fjord" to long, branching sea inlets with steep, high walls and submarine rock-sills at their entrance, such as are found on west coasts in high latitudes, as in Norway, Scotland, British Columbia, Chile, and New Zealand. Other sea lochs believed to be of similar origin but with lower banks have been termed "fjards," such as those occurring on the southern coast of Norway, from Stavanger eastwards, and round the coasts of Sweden. The main difficulty in elucidating the origin of these fjords lies in the fact that much of the evidence remains hidden beneath their waters. It is generally held at the present time that fjords originated as river valleys which were over-deepened by glacial action and subsequently drowned. Some geographers, particularly D. W. Johnson, deny that drowning occurred, and point out that the ice could work below sea-level before being floated off as icebergs, and therefore attribute the great depth of the inner part of the fjords to the abrasive action of the great glaciers alone. Recent slight elevation has produced raised beaches, which provide some of the scanty lowlands available for human settlement. Accompanying the fjord coast of Norway is a somewhat discontinuous shelf of land reaching to about 100 feet high and of rounded and dissected form. The explanation of this comparatively low-lying land, the so-called "strand-flat," is also highly controversial, and so also is the origin of the fringe of islands known as skerries. The skerries, which are low, hummocky islands strewn with morainic material, are not to be confused with the lofty islands which have only been separated from the mainland by glacier-filled tributary valleys of the fjord system. Many

writers consider that the skerries and the strand-flats are remnants of a plain of marine denudation, but as the strand-flats are to be seen in places even inside the fjords, where the action of waves would be negligible, recent writers have doubted this.

As far as human geography is concerned, the fjord life is highly distinctive. The scarcity of lowland has concentrated attention on the sea, especially behind the sheltering skerries and in the fjords. There are good fishing-waters inshore, particularly for herring, cod, salmon, and brisling, and there is practically no trouble

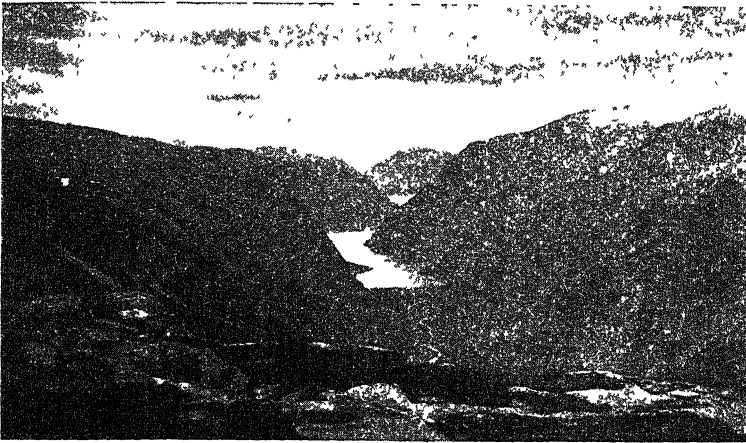


FIG 52—SIMODALEN, SHOWING A BRANCH OF THE HARDANGER FJORD.

Note the U-shaped valley and the even skyline. Those who know the English Lake District will notice the similarity of this view to that of Westwater as seen from Great Gable

from ice, in spite of the high latitude, owing to the warming influence of the Gulf Stream Drift. Up to recent years, however, there were few people engaged solely in fishing. The fjord economy south of Trondhjem was essentially three-fold, based primarily on the small area of pasture or arable land near the coast on which was situated the homestead, and only supplemented by the harvest of the sea and to a smaller extent by the summer pasture centred round the sæter (mountain hut) on the fjeld.

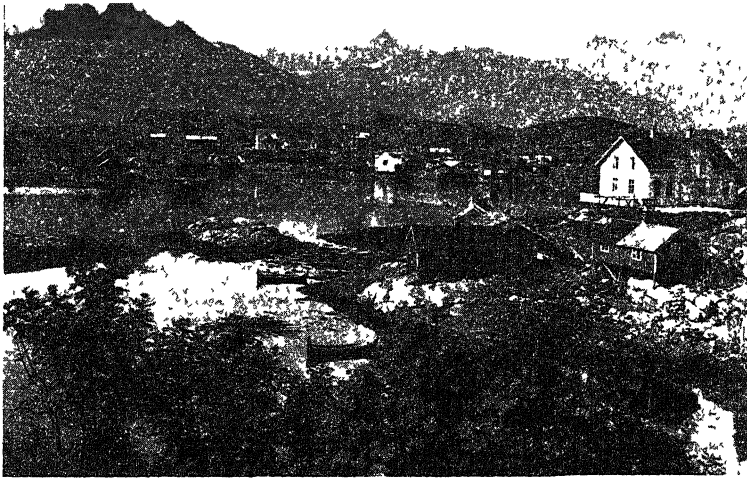
Bergen (98,000) is the only large town of this area, apart from Trondhjem, which is not quite typical. In fact, there is little opportunity for urban development on a fjord coast, owing to the lack of hinterland and of

facilities for centralisation. Bergen itself had no hinterland at all until the recent construction of the marvellously engineered Voss railway across the Hardanger Vidden, and this remains a tourist rather than a goods line. Bergen is the main centre of the fishing and shipbuilding industries. Trondhjem (54,000) on the Trondhjem Fjord has the great advantage of lying in a fertile depression, which coincides with the outcrop of a band of soft rocks in the Caledonian folds, a quite exceptional occurrence on the fjord coast. It is the centre of a small but productive agricultural region and is the oldest cultural centre of Norway. It also lies at the west end of a through-valley connecting it with Jemtland in Sweden, as well as at the north end of the Glommen route leading to Oslo. Both these routes are followed by a railway. Elsewhere, apart from a few small market towns and fishing centres and an occasional factory manufacturing electro-chemical products, the population is very scattered, the single homestead being the normal unit of settlement. This extreme dissemination of population was very adverse to political unity, and may be put forward as one of the causes that led to the long domination of Norway by her richer and better organised neighbours between the fourteenth century and 1905.

The Northern Strip.—North of the Trondhjem depression, which lies about 64° N., there stretches for 1,000 miles the northern strip or "tail" of Norway. Only six miles wide at its narrowest part east of Narvik, it is nearly one hundred miles broad in Finnmark, but its mountainous interior is almost entirely an unpopulated waste, apart from a few Lapps (called Finns in Norway), who pasture their reindeer on the scanty vegetation. The population is otherwise entirely coastal and largely in the islands, the mail-steamer providing the only regular means of communication among the small, scattered communities, which are almost entirely dependent on the sea for their livelihood. Narvik is the Norwegian rail-head and port for the Swedish iron-ore field of Lapland. Tromsø (10,000), on an island, is the seat of the whaling and sealing industry. Hammerfest, $70^{\circ} 35'$ N., is the most northerly town in the world.

Historical and Economic Summary.—One of the most interesting aspects of the history of Norway concerns the exploits and migrations of the Vikings or Norsemen. Although the Norsemen came from Sweden as well as

from Norway, those Vikings who changed the history of western Europe came mainly from the *vik* or "calm waters" of the fjords. It is tempting to think of the Vikings being forced out to sea by the poverty of the land and attracted southward by the warmer climes of England, Normandy, and so on, but when it is considered that emigration from Norway of whatever kind was practically non-existent from the thirteenth to the nineteenth century, it becomes evident that other causes besides the geographical ones were operative.



[Courtesy Norwegian State Railways]

FIG. 53 —SVOLVAER FISHING HARBOUR, LOFOTEN ISLANDS

Between the Saga Age and the twentieth century Norway suffered a long period of political eclipse. From 1319 to 1814 Norway was politically dependent on Denmark, and from the Napoleonic Wars onward it was united to Sweden, and only achieved independence in 1905, a separation, it may be added, which was accomplished with the consent of the Swedes and without bloodshed. The extremely scanty and scattered nature of the population contributed to the long period of eclipse, since it rendered the concentration and the rallying of forces exceedingly difficult. Even to-day there are only two railways connecting the capital city with the long north-west coast. Exhaustion following the loss of man-power in

the Saga Age may also be cited as a cause of the decline, though the slowness of recovery is not easy to explain.

Owing to the great amount of emigration in the nineteenth century, it is reckoned that there are as many people of direct Norwegian extraction living outside Norway, mainly in North America, as inside it, and the present population of 2·8 million must be considered to approach the maximum which the country can support under present conditions, since only 3·6 per cent. of the area is capable of cultivation. About 36 per cent. of the population live mainly off the land, from farming and lumbering, 30 per cent. are engaged in manufactures and mining, 15 per cent. in commerce and land transport, 6 per cent. in fishing, and 3 per cent. in shipping. The numbers engaged in fishing appear small in comparison with the importance of this industry to the country and to the publicity it has enjoyed, but the percentage given applies only to men who are engaged in fishing as their *sole* means of support, and these are much less numerous than those who engage in fishing as a part-time occupation ; in fact, it is only since about 1890 that this new class of fisherman came into being, with the change-over from the old open boat to the decked boat, now mainly motor-driven. Norwegian fisheries are mainly in in-shore waters and little part is taken in the North Sea fisheries, but more than half the world's whaling industry is in the hands of Norwegians and is now carried on mainly in Antarctic waters. As regards the mercantile marine, the tonnage per head of population is the highest in the world and the part played in the national economy by the carrying trade is of great importance. Owing to the poverty of Norway's natural resources the ships are mainly engaged in carrying goods between foreign countries, only about one-tenth being engaged in the Norwegian coastal trade and another tenth between foreign countries and the home country. Contrary to what one might expect, the Norwegian carrying trade is not of great antiquity, but dates back only to the seventeenth century, and is much younger, for instance, than the Dutch. Nowadays, with the supersession of wooden vessels and sail by engine-driven ships of steel, Norway is not in a good position for shipbuilding. As regards total tonnage, the Norwegian mercantile marine ranked fourth in size in 1935, though only two fleets, those of Great Britain and the United States of America, are really much larger.

The Norwegian lack of coal and paucity of good iron ores, together with the small size of the home market, have all conspired to prevent the development of modern large-scale industries, and it is only in the twentieth century with the development of hydro-electricity that Norway's great store of power has been tapped. This is used for every conceivable purpose, and as regards manufactures is the prime cause of the establishment in the country of electro-chemical and electro-metallurgical industries, particularly the manufacture of aluminium, though the raw material must be imported, of carbide of calcium, though here again the necessary anthracite and coke employed must be obtained from foreign sources, and of nitrates from the air. The large timber industry also employs large quantities of hydro-electricity. Apart from these two main branches, Norwegian industry is mainly concerned with the preparation of canned fish and fish products, such as cod-liver oil, and with the manufactures of machinery used in the above industries and of tins for the preserving industries. Almost all the metals used in these industries must be imported, as only pyrites and iron ore are mined in any considerable quantities in the country. Small deposits of copper exist and are mined chiefly at Røros in Trondelag *fylke* on the Glommen railway line, and both copper and pyrites at Sulitelma, which lies east of Bodo. Iron ore is worked at Kirknes in the extreme north, 1.1 million tons being produced from this region in 1930, but only half a million tons in 1934. Norway is said to possess large quantities of iron ore in many other areas, but of such low iron-content that it does not pay to work under present conditions.

Notodden and Rynkan, both in Telemark, are noted for their great nitrate factories, and Odde and Tyssedal, on southern branches of the Hardanger Fjord for their electrical smelting.

Almost all the manufacturing industries work chiefly for foreign markets, owing to the small numbers of the home population.

THE SPITZBERGEN ARCHIPELAGO (Svalbard)

Norwegian sovereignty over these islands was officially recognised in 1920. The islands lie between 76° 30' N. and 80° 50' N., that is, in the latitude of northern Greenland, but they lie on the edge of the "Winter Gulf of Warmth"

and feel the influence of the Gulf Stream Drift, so that although the subsoil is permanently frozen to a depth of 600 to 900 feet, the harbours of the west coast of Spitzbergen are accessible to shipping in summer. The vegetation consists of tundra, and considerable ice-caps exist in North Island and Edge Island. The value of the islands lies mainly in the large deposits of good quality coal, of which 707,000 tons were exported in 1936, as against 257,000 tons in 1932, and 354,000 tons in 1934. Mining is carried on even in winter.

REFERENCES

"Geomorphological Studies in Norway," by H. W. Ahlmann, in the *Geografiska Annaler* (1919), may be profitably consulted, though it gives more detail than will be wanted by most students of geography. *The Norway Year Book* (in English), last issue, is a mine of information.

Per Nissen's *Ökonomisk-geografisk Atlas over Norge* (Kristiania, 1921) should be consulted if possible.

The most useful series of topographic maps is that on the scale of 1 : 100,000.

CHAPTER XVI

DENMARK

DENMARK is in the peculiar position of belonging on geological grounds to central Europe, but in almost every other respect to northern Europe, so much so that it is often included among the Scandinavian countries.

For purposes of comparison it may be said that Denmark is about half the size of Scotland, has a density of population about equal to that of Ireland, and resembles in climate and to a certain extent in landscape the eastern lowlands of England. The whole country is lowland, though the Baltic end-moraine runs northward right up the peninsula of Jutland. It lies nearer the east than the west coast, so that the western side of Jutland is covered by the sandy outwash plain from the end-moraine, whereas the eastern side of the peninsula and all the islands are covered mainly by the boulder clay of the ground-moraine. The glacial material reaches a thickness of over 600 feet in parts of the end-moraine, but is usually much thinner, and in places the solid rock appears at the surface, in the form of (*a*) chalk on the coasts, *e.g.* of north-east Jutland and of the islands, (*b*) Tertiary sands and clays in the south-west of Jutland, and (*c*) granite in the eastern part of the island of Bornholm, which belongs geologically to the Scandinavian massif.

The western coast is bordered by dunes similar to those of the northern Netherlands and similarly partly demolished and reduced to the North Frisian Islands in the south, but forming an almost continuous rampart to the coast farther north. Behind these dunes lagoons and marshes have formed, which add to the desolation of this western side of the peninsula with its naturally poor sandy heaths and harbourless coast. Through great efforts this unpromising western side has been improved and adapted to agriculture, mainly in connection with cattle-rearing, or where useless in that respect, has been planted with pine trees. The port of Esbjerg was created in consequence of the great trade of Denmark with the British Isles, for, paradoxically, though physically Denmark

turns its back on England, economically it looks to that country as its chief market.

The morainic hills of eastern Jutland intermingle with the fertile soil of the ground-moraine. The highest point of Denmark, which is under 600 feet, lies near the east coast just north of Horsens. The coast is broken by a number of long inlets, which were apparently formed as valleys by melting water from the great ice-sheet and which were afterwards drowned. They are called "fiords" in Danish, but are totally different in origin and appearance from the Norwegian fjords. On the east coast, and usually on these inlets, are situated most of the towns of the peninsula, such as Aarhus (91,000),¹ the second largest town in Denmark, Aalborg (48,000), and others.

The northern part of Jutland (Dan., Jylland) consists of varied materials, but largely of marine clays of post-glacial age (*Yoldia*), deposited when this part of Denmark was depressed beneath the sea. Sand and sand-dunes form the northern horn of Denmark, called Skagens Horn, known to English sailors as the Skaw.

The Danish islands, Zealand (Dan., Sjaelland), Funen (Dan., Fyn), Laaland, and many others, at the shallow entrance to the Baltic Sea, represent the remains of a plain which was continuous between Jutland and southern Sweden as late as post-glacial (*Ancylus*) times, but which has since been partially drowned. The straits of the Sound, the Great Belt, and the Little Belt presumably represent drowned river valleys, and all of them offer difficulties to large modern ships, the Little Belt being in any case too shallow, the Great Belt having a very winding and narrow deep-water channel, and even the Sound, which is most frequently used, having a depth insufficient for the largest of modern vessels. It is, however, sufficiently deep for all except the ocean giants, and since it connects the North Sea and Baltic by the shortest route it has long been the most important, and consequently was an important factor in the growth of Copenhagen (Dan., Köbenhavn).

The Baltic islands of Denmark may be looked upon as forming the heart of the country. They mostly consist of very fertile soil of the ground-moraine, with only occasional morainic ridges of coarser material. The islands are supremely well cultivated and thickly populated, the main branch of farming being the production of dairy produce, bacon, and eggs.

¹ Population figures are from the 1935 Census.

The city of Copenhagen has an abnormally large proportion of the total population of the country, numbering 843,000 inhabitants out of a total of $3\frac{3}{4}$ million, or one-fifth. It has been called the key to the Baltic, and in the heyday of the Danish navy Denmark was able to block the entrances of the Baltic in time of war and to impose tolls (at Helsingor) in time of peace. It possessed a protected harbour on the narrow river-like strait between Copenhagen and the island of Amager, and it may be noted that the main channel swings close to the western side of the Sound at this point. Copenhagen grew to greatness, however, when it was more centrally placed as a capital city than at present, since for many hundreds of years Denmark ruled the southern part of Sweden. Copenhagen stands at a crossing place of important land and sea routes, since the main land route leading from central Europe to Scandinavia here crossed the Sound. Since the construction of the Kiel Canal its position with regard to the entrance of the Baltic is less commanding. At the present day the city concentrates the intellectual, commercial, and manufacturing activities of the whole country.

The chief contribution of Denmark to modern Europe is the development of the co-operative system as applied to agriculture, especially to the marketing of agricultural products. Up to the 1860's Denmark was a country of mixed farming, producing cereals for export. The competition of the great prairies of Europe and America made cereal-growing unprofitable in this country of rather damp climate and small farms. The change in the agricultural system to co-operative dairy-farming was a deliberate step, planned by a few far-seeing men, and it was made possible by a great improvement in the educational system which was carried out at the same time. At the present day Denmark's agriculture is analogous to the large manufacturing industries of western and central Europe, since it depends to a large extent on imported raw material, in the form of cheap foodstuffs for animals, and it produces a number of highly standardised articles which are exported abroad. The co-operative system of marketing is especially helpful in this country of small-holdings, but it should be noticed that with the introduction of the modern dairying industry the number of small-holdings was greatly increased, as it was considered that a farmer and his family working his own small-holding

would give more care and attention both to quantity and quality than hired hands. Also the commodities of butter, bacon, and eggs, which are the export staples, are all foodstuffs which can be fairly easily graded and which keep fresh for a considerable time. Co-operative pooling and selling of these commodities inside the country has not met with success.

Denmark's example has been followed to a greater or less extent by all the Baltic countries, particularly Sweden and Finland, and is in course of extension to Estonia, Latvia, and Lithuania. The continued expansion of this system depends, however, on the capacity and the willingness of foreign countries with a large manufacturing population to continue importing foreign dairy produce. Great Britain is the chief market for Denmark, and in no conceivable circumstances could produce all the butter, bacon, and eggs needed by its population of 49 millions, but under modern conditions of transport and cold-storage it is increasingly easy to import dairy produce from the distant agricultural lands of the Empire.

Denmark has few large manufacturing industries other than the agricultural ones, the lack of coal and water-power hindering their development, though there are a considerable number of small industries working for the home market and mainly localised in Copenhagen, of which the most noteworthy is shipbuilding, though the porcelain industry is better known abroad. The glove industry of Randers is also well known. Three-quarters of the exports are animal products, and the imports consist mainly of cereals and other foodstuffs for the human population, fodder crops for the live-stock, and manufactured goods such as textiles. The British Isles takes two-thirds of the exports and is therefore easily first, but stands behind Germany and U.S.A. as a provider of imports.

ICELAND

Iceland is a sovereign state, but owes allegiance to the King of Denmark. It is situated between $63\frac{1}{2}^{\circ}$ N. and $66\frac{1}{2}^{\circ}$ N., and covers an area of 40,000 square miles. It lies within the "Winter Gulf of Warmth" and its southern coasts are rarely frozen. The island consists of a plateau covered with young volcanic material from which rise active volcanoes, *e.g.* Hekla (5,107 feet). Both latitude and altitude are adverse to cultivation, indeed, ice-sheets

cover the higher parts of the plateau, and only one-seventh of the land is classified as productive. Only one-quarter per cent. is actually under cultivation, which is confined to hay, potatoes, and turnips. The population numbers 109,000 (census 1930), giving 2·7 per square mile, and is mainly concentrated on the coastal lowlands. Fishing is the chief source of wealth.

REFERENCES

Modern Denmark, by Hugh Jones (London, 1927), gives a good short account of the farming and economic life. See also *Denmark 1931* (published by the Royal Danish Ministry for Foreign Affairs and the Danish Statistical Department, Copenhagen, 1931).

The topographic map on the scale of 1 : 160,000 is coloured and gives heathland, etc., but shows no contours. There are other useful series on scales of 1 : 40,000 and 1 : 100,000.

SECTION IV—CENTRAL EUROPE

CHAPTER XVII

GENERAL INTRODUCTION TO CENTRAL EUROPE

THE concept of central Europe is a familiar one not only to geographers but to the general public. The region, however, cannot be said to possess any structural unity, since it is composed of three main morphological types, namely, a glaciated lowland in the north, worn-down fragments of the Hercynian system in the middle, and a young folded mountain system with included plains in the south. Climatically, it is true, there is a general similarity, since the whole region has cold winters with a mean January temperature below freezing, warm summers (c. 64° F. to 75° F. for July), and a fairly well distributed rainfall with a maximum in summer. Consequently there is a general similarity of natural vegetation and cultivated crops, but only very generally, since crops needing summer warmth such as maize and the vine, which flourish in the southern parts of central Europe, are unable to reach maturity in the north. Also, in contrast to the forest-covered plains of north Germany and Poland, the plains of south-central Europe are mainly covered with prairie-like grasslands. As regards culture and language, also, there are wide divergences, since central Europe is divided between two main language groups, the Germanic and Slavonic, with certain smaller additional elements such as Hungarian, Turkish, and Romanian. As regards the stage of development, too, there is a great contrast between the modern up-to-date social and economic life of, say, Germany and Switzerland and the much more primitive social organisation and undeveloped economic life of, say, Romania or Bulgaria.

The interior position of this kernel or core of Europe is the key to the matter. Central Europe is, indeed, transitional between east and west, north and south, and is therefore more varied within itself than any of the other main regions of Europe. For instance, in relief it lies open to eastern Europe both in the Germano-Polish and the Romanian

the more stable, drier, and more extreme eastern Europe. Historically, it came later into the civilised world than the southern and western margins of Europe, but earlier than eastern Europe. In this great region, however, there may be distinguished two main sub-regions, of somewhat different climate and of considerable differences of outlook. In the first region, which may be called north-central Europe, we have an area which either by latitude or altitude has generally cooler summers than the south-east, and where the rainfall is generally sufficient to produce a natural vegetation of forest. Here, also, are the German-speaking lands of Germany, Austria, and the mass of Switzerland, which culturally may be considered as practically West-European and have a long tradition of high culture behind them. To these may be added the Slavonic-speaking Czechs of Bohemia and Moravia and the Poles, who have both been intimately concerned in the history of western Europe, though economically their countries are now less developed. Opposed to north-central Europe is south-central Europe which historically has been bound up with eastern Europe. With its dry steppe-covered plains surrounded by mountains, but open to repeated invasions from the east, its development has been delayed in almost every respect. Both regions may be looked upon as essentially non-maritime, in spite of the modern development of Germany's navy and mercantile marine.

North-Central Europe.—There are three structural elements in the build of north-central Europe. Of these the most widespread and continuous is the Germano-Polish lowland which stretches right across the north of the region and even across the frontiers of Germany into Holland on the west and Denmark on the north. On the east the Prypeć marshes on the Polish-Russian border may be taken as the boundary, and on the south it extends to the highlands of central Germany and the uplands of central Poland. The northern margin of these highlands and uplands runs from the Weser hills, along the Harz Mountains, Erzgebirge, Sudetes in Germany, and along the Polish Jura, the Łysogóry, and Lublin hills in Poland, but there are many bays of lowland interrupting the higher land especially in Poland, where many authorities would consider the upland zone itself as part of the lowlands. The whole lowland is covered with unconsolidated deposits resulting from the ice-sheets of Quaternary times.

The central highlands of Germany and the central uplands of Poland belong to the Hercynian zone, where the structure is dominated by the extensive stumps of the former vast Hercynian chains which were originally folded in late Carboniferous times. These stumps underwent elevation in the great positive movement of Tertiary times, and at the same time the overlying sediments were often warped upwards, so that even where old rocks do not actually appear on the surface, the relief is affected by the Hercynian formation. The name is derived from the *Hercynia silva* or Hercynian forest of the Romans, a term which was applied somewhat vaguely to what we now call Bohemia, whence the name has been extended to apply to all similar horsts of the same age and origin. The Polish uplands belong structurally to this region, but were sufficiently low for the maximum advance of the ice-sheet to over-ride them—at least, for a short period. The highest point reached in this zone of the central highlands and uplands is about 5,000 feet, but even the highest land usually shows the rounded land forms which characterise the so-called block mountains of Europe. The central Rhinelands will be included here on structural grounds, although Alsace and Lorraine are politically French.

In contrast, the third region, that of the Alps, consists of great chains whose mighty peaks, covered with ice and snow, rise to a height of over 15,000 feet. The folded Swiss Jura may be included in this zone, and also the Alpine Foreland, of Switzerland, Germany, and Austria, since it is built up of the waste from the Alpine denudation.

REFERENCES

A very full account, well illustrated by diagrams and photographs, is given in *Europe Centrale*, by E. de Martonne (Part I, Generalités, Allemagne, Paris, 1930, and Part II, Suisse, Autriche, Hongrie, Tchécoslovaquie, Pologne, Roumanie, Paris, 1931) *Länderkunde von Mitteleuropa*, by F. Machatschek (Leipzig and Vienna, 1925), gives a good short account dealing chiefly with the physical aspect, and contains an exhaustive bibliography. J. F. M. Partsch's *Central Europe* (London, 1903) is the only large work in English, and though much out of date contains some useful material.

CHAPTER XVIII

THE GERMANO-POLISH LOWLAND

lowland is covered with unconsolidated, superficial deposits laid down by great ice-sheets which spread out from Scandinavia in Quaternary times. These deposits consist of various kinds of glacial material, such as boulder clay, morainic material, gravel, sand, and wind-blown loess, either deposited *in situ* or reworked by wind and water, and their thickness has been proved by borings to vary from about 40 feet to more than 600. Only very occasionally can the solid geology be seen through the covering mantle, as, for instance, in the gypsum outcrop of Sperenberg, or the muschelkalk of Rudersdorf near Berlin, though the islands of Rugen and Heligoland both reveal the underlying rock in their cliffs of chalk and Bunter sandstone respectively. The deposits were evidently laid down on a pre-existing lowland surface composed mainly of Tertiary material, a fact which is of economic significance in connection with the deposits of brown coal in the southern part of the German lowland (e.g. in Nieder Lausitz, the lowland bays of Leipzig and of Cologne).

The lowland surface offered no obstacle to the successive advances of the great ice-sheet, whose greatest extension was only stopped by the mountains of central Germany, the Harz, Erzgebirge, Sudetes, etc., and by the Carpathians of southern Poland. The later advance or advances, however, had evidently less momentum behind them and petered out in the plain itself.

Over the greater part of the Germano-Polish lowland east of the Lüneburger Heide, the glacial material is arranged in a number of concentric bands, which run mainly in an east and west direction, or more correctly, parallel with the generalised line of the southern shore of the Baltic. The plain immediately bordering the Baltic rises quickly to the Baltic Heights, which reach over 1,000 feet in places. South of these is a zone consisting of great shallow valleys alternating with bands of rather higher ground, and south of these again comes a loess-covered zone

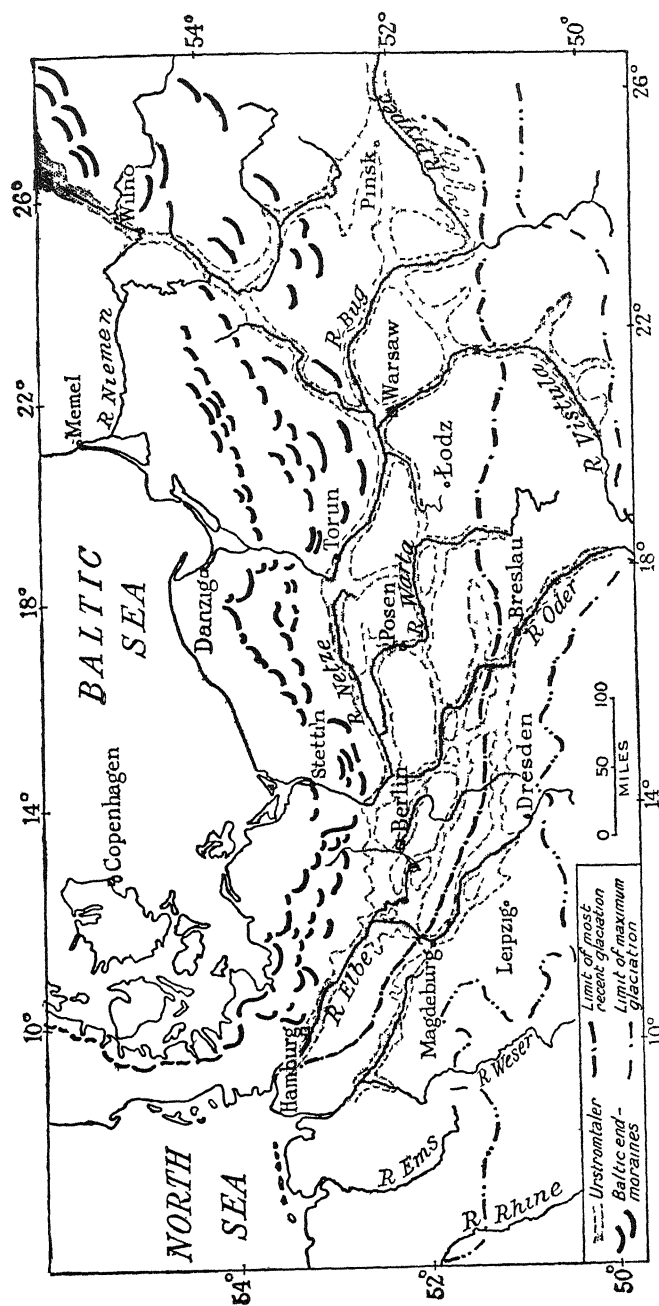


FIG 55 — DIAGRAM OF THE GERMANO-POLISH PLAIN, SHOWING SOME OF THE MAIN ASPECTS OF GLACIATION.

bordering the mountains. The lowland is not wholly devoid of relief, though there are large areas of flat land, both in and between the great valleys. West of the Luneburger Heide this concentric arrangement is not found and there is practically no break in the flatness of the plain.

There are three main types of deposits associated directly with those parts of an ice-sheet which are far from the centre of dispersion and which have reached low ground. First, there is the finely pulverised material of the ground-moraine beneath the ice. This is known as boulder clay, which, as its name implies, is generally mixed with coarser material dropped from the body of the ice-sheet as it melts in situ. Secondly, if conditions are favourable for its formation, there is the end-moraine, which consists of very mixed material, including fragments of rock of all sizes, from grains of sand to large boulders, which have been carried in and above the ice-sheet rather than under it, so that there is much less fine abraded material than in the boulder clay. A terminal moraine is not, of course, a necessary accompaniment to an ice-sheet; in fact, it can only be formed when the rate of growth and the rate of melting are so nicely balanced that the edge of the sheet stays in one place for a prolonged period of time. Thirdly, there is the outwash material (Sandr) which the waters of the melting glaciers carry away with them, and which consists mainly of the finer particles from the end-moraine, particularly sand. A fourth type of deposit may be added, namely, the loss, but this is a product rather of the interglacial and post-glacial than the glacial periods. These periods were dry, so that steppe-like conditions prevailed over the unconsolidated material of the newly exposed surface. The loose, dry particles could easily be picked up by the wind, which carried them, no doubt, in different directions, but a large number of particles were arrested on the wetter southern margins, which here were along the northern foot of the mountains of central Germany and southern Poland. This loss band consists of very finely powdered fertile soil and gives rise to a zone of very productive agriculture which contrasts remarkably with conditions over the other part of the plain.

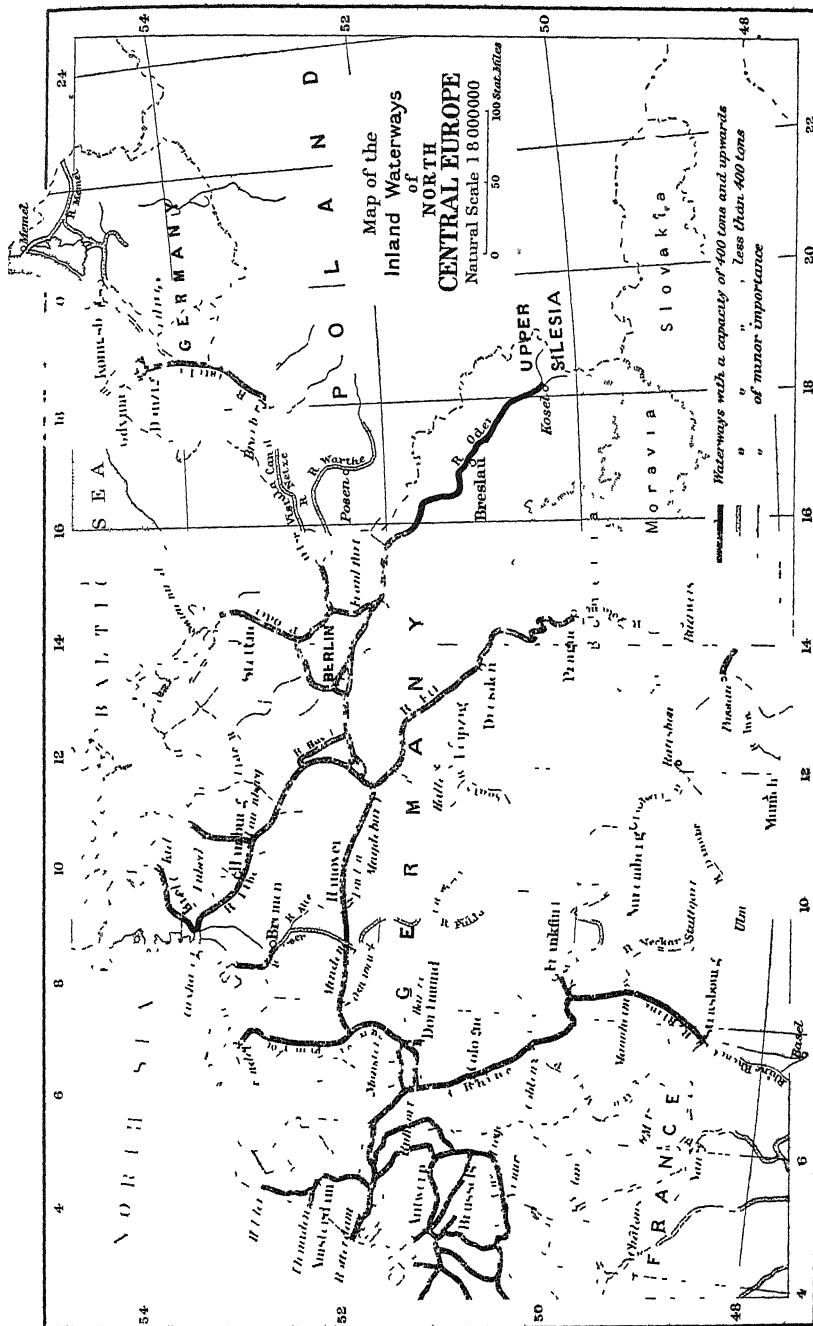
There appear to have been three or possibly four periods of advance of the great ice-sheet in the Germano-Polish lowland and two or three corresponding periods of retreat,

in the last of which we are now living. These advances were of decreasing order of magnitude. The first advance, although it reached farther south than the others, has left little impress on the present topography, either because time and weather have obliterated the marks of its terminal moraines or because no extensive terminal moraines were formed. The present topography of the lowland seems to be the result of the last glaciation, which was so recent, geologically speaking, that subaerial erosion has not yet had time to blur the work of the ice. Along the shores of the Baltic is the ground-moraine zone consisting of a dune-fringed belt of lowland covered with boulder clay, similar in character to that of East Anglia, and similarly formed under the ice-sheet. The soil here is heavy and tenacious and generally fertile, but difficult to work. It was covered originally with deciduous forest, mainly beech. Southwards the land rises, and the proportion of boulders increases until the typical end-moraines, of coarse angular material, are met with. These are generally unsuitable for cultivation and retained under forest, consisting mainly of coniferous trees. The vast accumulation of morainic material in these Baltic Heights bears witness to the length of time during which the end of the ice-sheet must have rested here. This, however, was but one period of pause in the spasmodic retreat of the most recent ice-sheet, and there are a number of other end-moraines parallel to the Baltic Heights, though these more southerly ones are lower and more discontinuous. In front, i.e. south of each of these end-moraines, one would expect to find an outwash plain of sand, but matters were here somewhat complicated by the fact that from the southern border of the glacier the ground sloped slightly upward, so that the melt-water could not flow directly away from the ice face, but had to flow along its front for a long distance, until a lateral way of escape could be found. Moreover, the amount of water hemmed in between the ice and the mountains was augmented by the drainage from the mountains themselves. In consequence of the spasmodic retreat of the ice-sheet northwards a number of these great east-west depressions were formed, and these great *urstromtaler* ("former river valleys"), as they are called in Germany, form a characteristic feature of the landscape of the greater part of the north German lowland. In Poland the *pradoliny*, as they are called there, are less in evidence, especially in the central uplands

(Łysogóry, Lublin plateau), which were apparently not covered by the last glaciation owing to the great distance from the Baltic and from the centre of dispersion of the ice-sheet.

Even in the Polish plain, although there are two well-marked *urstromtaler*, which connect up with those of Germany, and short sections which look like *urstromtaler*, yet they are far fewer in number and farther apart than between the Elbe and Oder. This seems to have been due to the different configuration of the country, with lines of higher ground running from south to north, and so preventing the easy lateral escape of water and leading to the formation of great ice-dammed lakes. Also there are fewer end-moraines in the Polish section of the lowland, particularly east of the Vistula and south of the Bug, which seems to indicate a more continuous melting or a smaller amount of débris

Most of the *urstromtaler* of Germany and Poland do not carry any considerable quantity of water at the present day, for the supply of water from a melting ice-sheet is no longer available. Nor, as can be seen from the map, do they form the main arteries of any water system. On the contrary, the main drainage is now generally from south to north. This diversion of the drainage evidently took place following the disappearance of the ice-sheet. Active erosion began on the part of short streams flowing to the Baltic Sea from the Baltic Heights. These evidently cut back their heads, and where conveniently situated south-flowing tributaries were met with, river capture took place; note the marked elbows of capture in the Oder east of the Havel-Oder canal and on the Vistula at Bromberg. Similar elbows of capture can be seen farther south, e.g. on the Warthe at Schrimm, on the Elbe near Magdeburg, so that this process seems to have occurred at each main recession of the ice-sheet. Borings reveal marked valleys below the glacial deposits in the lower courses of the Weser and Elbe, as well as of the Oder and Vistula, and also in the upper (Silesian) course of the Oder, so that it seems possible that the development of the main streams of the present river system is guided in part by the pre-glacial topography. This is all the more likely as the general direction of the Oder, Elbe, Weser, and Aller follows the same south-east to north-west trend as the faults bounding the Sudetes, the Bohmer Wald, the Thüringer Wald, and Harz Mountains of the Hercynian system



farther south. The *urstromtaler*, though no longer occupied by master rivers, yet afford admirable opportunities for the construction of canals. The floors of the depressions are usually marshy, though often partly choked by sand-dunes, which were accumulated by the wind in post-glacial times. The particles are coarser than those of the loess, which were carried much farther. Owing to the present damp climate these dunes are generally no longer active, but are mainly covered with vegetation, particularly pine forest and heath, and the marshy tracts have mainly been drained, as they provide the most fertile soil of the Germano-Polish lowlands. For long, however, the great marshy *urstromtaler* proved great barriers and offered great difficulties to settlers. Dutch and Flemish workmen carried out much of the reclamation in the *urstromtaler* both in Germany and Poland, and Frederick the Great is said to have "subdued a province in time of peace" by the drainage of the Oderbruch. The land between the *urstromtaler* offered even less promising material, since it consists mainly of the sandy outwash material and of the end-moraine itself. Unfortunately the retreat of the glacier usually resulted in the fertile ground moraine being covered up by the infertile material of the end-moraine and outwash sand, and only in a few places, presumably where the ice-sheet was not carrying a heavy load of coarse material, does the boulder clay remain on the surface, though deep borings have reached two and sometimes three layers of boulder clay at increasing depths. The discovery that the potash salts (*kalisalz*) of Stassfurt could turn this "sand-box" (*streusandbuchse*) into quite moderately good land created a revolution in the husbandry of the north German plain in the nineteenth century, and the knowledge is now spreading even into eastern Poland.

West of the Luneburger Heide the same infertile sandy and gravelly soil is found, but there are no *urstromtaler*, and the region is generally a featureless plain. It is considered that the edge of the last ice-sheet did not extend beyond the Heath, and the region to the west is covered partly by the sand of the outwash plain and partly by sand of the older glaciations. Wide, infertile, dry, sandy regions called *geest* are intersected by the marshes of the river valleys and fringed by the marshes of the coast. The region evidently underwent subsidence at the close of the Ice Age, when the North Sea came into being and

the English Channel was opened. The sea even invaded part of the present coast-lands both in western Germany and Holland and penetrated the lower courses of the existing river valleys. It is possible that a slight uplift followed, but it is not necessary to postulate this to explain the present topography. Sandbanks were formed by the currents sweeping parallel to the coast and developed into lines of dunes. Between the dunes and the shore were shallow lagoons, which gradually became largely transformed into marshes by being filled up with silt and by the growth of halophytic plants. It is possible that further sinking took place, since the protecting line of dunes was later pierced by the sea and in the east was reduced to a string of islands, known as the West, East, and North Frisian Islands, the first of these being Dutch, the second German, and the last Danish. Much of the marshland was again converted into shallow lagoons, known as *watten*, which are uncovered at low tide, and even the low-lying mainland was invaded by the sea to create the Jadebusen (eleventh century), the Zuider Zee (thirteenth century), and the Dollart (fourteenth century), which were all afterwards enlarged by further flooding. It is the tidal flats along the coasts and up the river estuaries which have been worth the trouble of reclaiming by prodigious efforts of dyking and pumping, since they are covered with fertile silt, whereas the sandy soils of the mainland, though available without any such trouble, are so sterile as to be practically worthless.

CHAPTER XIX

GERMANY—NORTHERN SECTION

BEFORE the *Anschluss* with Austria and the annexation of Bohemia and Moravia, Germany was already the fourth largest country in Europe as regards area and the second largest as regards population. The new acquisitions bring her total area up to 244,000 square miles, or even more if Slovakia is included. This places Germany well ahead of France and Spain in area and second only to Russia, while the total population now numbers more than eighty millions. The German state only came into being officially in 1871, when the King of Prussia became Emperor of the German "Reich" or Empire, which incorporated many formerly independent states, but actually a loose union had taken place earlier with the formation of the Zollverein or Customs Union in 1834. With the abolition of the internal customs barriers the way was open to the industrialisation of the country and to the utilisation of its vast resources, so that although Germany got a late start in the Industrial Revolution yet she fully caught up to the industrialised western countries and in some ways surpassed them. Economically, indeed, Germany belongs to western Europe, but her central position gives the country certain special advantages and disadvantages and a somewhat different outlook from that of the western countries. Among the disadvantages may be mentioned the fear of being ringed around by enemies, but as the country is so much the superior of its neighbours in natural resources and man-power this fear may be looked upon as illusory, while the central position is obviously a great advantage for trading.

Physically, Germany lies partly on the glaciated lowlands, partly in the Hercynian zone, and partly on the Alpine Foreland, and partly in the Alpine zone.

[For Austria, see Chap. XXV, for Bohemia and Moravia-Silesia, see Chap. XXVII.]

THE NORTHERN LOWLANDS—(A) WEST OF THE RIVER ELBE

The lowland is here at its narrowest, the distance between the Jadebusen and the Weser uplands south of Minden

being about seventy-five miles. In this generally featureless area variety is provided mainly by differences in land utilisation, which are based mainly on differences of soil. There are four types of landscape in this area, (i) the reclaimed land called *marschen* along the coast and river estuaries, (ii) the bogs developed on excessively flat parts of the mainland owing to the lack of gradient and called *moore* ("moors" or "bogs"), (iii) the heath lands of the higher and drier sandy stretches called *geest* ("infertile"), and finally (iv) in the south the well-cultivated strip covered with loess and loam along the foot of the mountains. Human activities are mainly concentrated in the first and the last of these regions, and especially on the river estuaries of the North Sea coast.

The Geest.—The *geest* is divided into two parts, the larger and higher section, known as the Luneburger Heide, lying between the River Elbe and the River Aller, and the smaller and lower section between the River Aller and River Ems. The Luneburger Heide reaches the modest height of about 350 feet, but its surface is often quite flat and rarely more than undulating, though its sides are rather steep where it descends to the valleys of the Elbe and Weser. Although the outer edge of the last ice-sheet probably reached here, the Heath shows but few traces of end-moraines except in the north-west and the south-east. The highest part (Wilseder Berg, 554 ft) has been set aside as a national nature-park and wide tracts of the Heath have been planted with coniferous trees in recent years. The scanty population wrings a hard livelihood from the infertile soil, but there are supplements to the food supply in the form of honey, rabbits, and an abundance of game birds. Rather better soil is found in the infrequent valleys. The section west of the Aller is similar, but smaller and less continuous, being encroached upon by moors and by the alluvium of the river valleys.

The "Moore" or Bogs.—These peat-bogs have an appearance very similar to those of Ireland. They are similarly caused by lack of drainage. Two types are distinguished: those at a considerable elevation, where the peat appears dry on top but in reality is sodden with water, and secondly those at lower levels, which are often partly water-covered. Wide areas have been reclaimed within the last sixty years by the Dutch system, involving drainage and removal of the peat, the enriching of the underlying sand with this product, marling and manuring, and the addition of silt dredged up from the rivers. The

new agricultural settlements on the moor are called *Fehnkolonien* ("fen-colonies"), and cultivate potatoes, green vegetables, some cereals, and are engaged in cattle-rearing. The peat itself is burnt for domestic use or converted into electric power.

The Löss Belt.—The löss belt is known in parts as *Borde* (dialectal German=English "border"). It is narrow north of the forested Weser uplands and wider in the lowland bay of Magdeburg, Halle, and Leipzig, where also it is drier, since it is less open to the prevailing south-west wind. The loss is usually treeless and hedgeless and devoted especially to the cultivation of sugar beet, with the usual accompaniment in the crop rotation of cereals, especially wheat, and the usual subsidiary stock-rearing on the basis of the beet pulp left over after the sugar is extracted. Agricultural industries are scattered throughout the countryside and also concentrated in the old market towns of Hanover (Ger., Hannover), Brunswick (Ger., Braunschweig; 167,000), and Magdeburg (307,000). The old gap and market town of Magdeburg sprang into new life in connection with these activities and is the leading beet-sugar market of the country. In the Magdeburg-Leipzig lowland the discovery of the potash salts¹ of Stassfurt, Hanover, and Halle at great depth, and the still more recent discovery of lignite under a thin mantle of glacial material, have led to an active development of other industries.

The exploitation of the lignite on a large scale has only taken place during the twentieth century, and was much intensified after the Great War, partly to make up for the loss of the greater part of the Silesian coalfield, and partly owing to the improvements in electrical transmission of power, which solved the problems connected with transporting this bulky commodity over long distances, *e.g.* to Berlin. This district of the Magdeburg-Leipzig lowland produced 127 million tons of lignite in 1937 and is the most important lignite-mining area not only of Germany but of the world. The power produced, however, is not large compared with that from the Ruhr coalfield, since the calorific value is less than one-half that of bituminous coal, but even taking this into account, the fuel value is very considerable. The main branch of industry is the chemical, including the manufacture of fertilisers, dye-stuffs, caustic soda and washing soda,

¹ Formed by evaporation of a marine lagoon during Upper Permian,

² Zechstein period

nitrogen from the air, etc. The manufacture of machinery is also important, in spite of the lack of metals. Leipzig itself is specially noted as the leading German printing and publishing centre and has allied industries such as paper-making, in addition to its metallurgical (optical and electrical) and textile industries.

The presence of two large towns so near together as Leipzig (713,000)¹ and Halle (209,000) is the result of the political subdivision of Germany before 1871, a frontier line formerly running between the two towns. The more central position of Leipzig has favoured its growth, and so also have its famous twice-yearly industrial fairs, which date from the twelfth century.

The North Sea Coast of Germany.—The sea coast and lower courses of the Elbe, Weser, and Ems are bordered by reclaimed lands which have been gained from the flood by means of dyking and drainage. These *marschen* carry chiefly meadowland for cattle and horses, but also grow beet-sugar and vegetables in the parts quite free from salt, Hamburg in particular making a large demand for market-garden produce. The rich soil of the *marschen* supports a large farming population, in spite of the danger of living below the level of high tide.

Between the coast and the dune-covered islands, with their sandy beaches and holiday resorts, are the tidal flats or *watten*, which are dry at low water except for channels of greater or less depth where rivers, great and small, cut across them to the sea. It is obvious that the only means of entry for shipping is up the estuaries, which fortunately are numerous in relation to the length, or rather the shortness, of the coast.

Although the North Sea coast of Germany is less than 100 miles long (as the crow flies), yet it is much more important than her long Baltic coast, mainly because it has direct access to the open ocean and is very little troubled by ice in winter. There is no port on the Baltic coast to compete with Hamburg, which has a population of over a million and is the leading port of the mainland of Europe and therefore one of the leading ports of the world. Hamburg is a self-governing city and a member of the old "Hanse" or league of free German cities that dominated the trade of central and northern Europe in the later Middle Ages. The town grew up on the Alster, a right-bank tributary of the Elbe, where the firm ground of the *geest* offered a dry site.

¹ Population figures are from the 1933 Census.

It was only in the twelfth century that Hamburg became important as a port, and then merely as a satellite of Lubeck on the Baltic. It profited, like Liverpool, from the discovery of the New World of America, especially after that continent was opened up to international trade in the late eighteenth and early nineteenth centuries; but its most rapid growth came later with the extension of the power of Prussia and the unification of Germany under the Empire. Naturally, also, the increased agricultural productivity and the accompanying increase of population in the North German lowland greatly increased the importance of its hinterland.

Hamburg entered the German Zollverein as late as 1888, but retained many privileges, including its free port, whose freedom from customs duties has enabled it to become a great entrepôt like London.

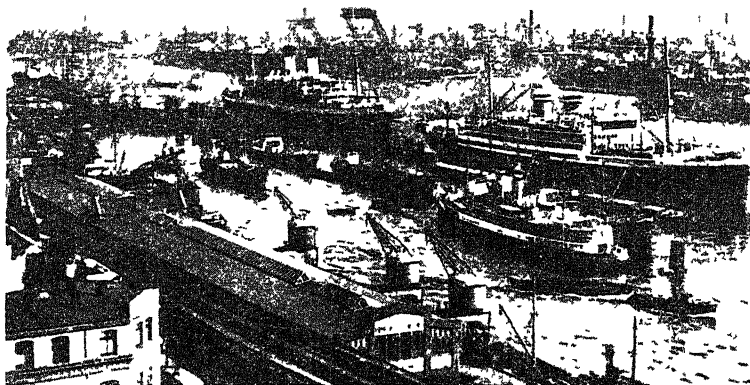
At the present day the city not only extends to the Elbe, but also has its newer quays on the farther, *i.e.* southern, side of the more northerly channel, in the islands of the estuary. Here the soft alluvial *marschen* made excavation easy, whereas the firmer sand on the high right bank made harbour construction difficult. Owing to the small amplitude between high and low tide, averaging only 6 feet 6 inches, there is no necessity for lock gates to the basins, so that no time is lost in entering and leaving the quays for this reason. The port is actually about eighty-five miles from the first Elbe lightship, which is taken as the mouth of the estuary, but dredging has given a channel deep enough for the largest vessels afloat and some of the basins have a depth of 36 feet. Its outport of Cuxhaven (18,000), however, has been built for passenger traffic, since the slow eighty-five miles' journey up the river wastes half a day.

The hinterland of Hamburg comprises all the land drained by the Elbe and its tributaries, including the canal system between the Elbe and Oder and the Bohemian section of Czechoslovakia, but it comes into competition with the Rhine ports and even with Bremen on the west and with Stettin on the east. The River Elbe was the main highway for the movement of goods to and from the port until the network of railways became fully organised. Even now nearly half the goods-traffic is river-borne, and inland navigation is considered sufficiently important to warrant the construction of new canals connecting the Elbe westward with the Weser-Ems-Rhine system, and so to link

up the two main inland-water systems of Germany, which are now isolated from each other.

Besides being a port, Hamburg is also a manufacturing centre, especially concerned with shipbuilding. A variety of other industries are carried on, but are of much less importance. Its suburb, Altona, is mainly an industrial town, and though it forms part of the Hamburg-Altona conurbation is under separate (Prussian) administration.

The other two North Sea ports of Germany are Bremen (323,000) on the Weser and Emden on the Ems. The



[Courtesy German Railways Bureau, London.]

FIG 57—PART OF HAMBURG HARBOUR.

Owing to the small amplitude of the tide, there is no need of enclosed basins with lock-gates

former is an older port than Hamburg, but its growth was hampered through its being on a smaller river, therefore having a smaller hinterland, and also because its estuary is shallower and narrower than Hamburg's. With its outport of Bremerhaven, which is accessible to the largest liners, Bremen is the second largest port in Germany, and like Hamburg is a free (Hanse) city. Its commerce is rather more specialised than that of Hamburg and it is the chief Continental cotton-importing town and market. Bremerhaven, together with Wesermünde, is the leading fishing port of Germany. The port of Emden

was created with the object of capturing some of Rotterdam's traffic for Germany. It has the advantage of being connected with the great coalfield and industrial area of Westphalia by means of the Dortmund-Ems canal, and has attracted to itself a large traffic, particularly in iron ore and timber from Scandinavia, besides its exports of coal from the Ruhr.

Generally speaking, the North Sea ports of Germany are engaged in importing goods from all over the world, in contrast to the German Baltic ports which mainly deal with goods from across the Baltic. Also the North Sea ports take the greater part of the overseas passenger traffic of the country.

THE NORTH GERMAN LOWLANDS—(B) EAST OF THE RIVER ELBE

The parallel arrangement of the main lines of relief and the main types of landscape in this region has already been mentioned

The Baltic Zone.—The actual coastline is singularly deserted, and economically stagnant except at one or two favoured points. The main drawback is a lack of good harbours, but even where deep water can be obtained, as at Stettin, the cessation of traffic in winter through ice trouble proves a severe handicap. The Baltic Sea is so cut off from the open ocean by the shallow sill on which the Danish Archipelago stands that it receives very little salt ocean water and has practically no tide. On the other hand, it receives large quantities of fresh water from the many rivers which flow into it, so that the coastal inlets, on which most of the harbours stand, contain almost fresh water and therefore freeze more easily than if they were salt (*cf.* Frisches Haff=fresh-water haven).

The poverty of harbours is much more marked in the eastern two-thirds than in the western section. The whole coast sank slightly in post-glacial times, so that one would expect a number of inlets to have been formed in connection with the drowning of river valleys and of glacial depressions. This drowning certainly occurred, and the *fjorden* of Schleswig-Holstein and the *bodden* of Mecklenburg were formed in this way. Wind and currents, however, conspired together to cut the inlets off from the sea, and were increasingly successful towards the east as they gathered force and as more material became available in

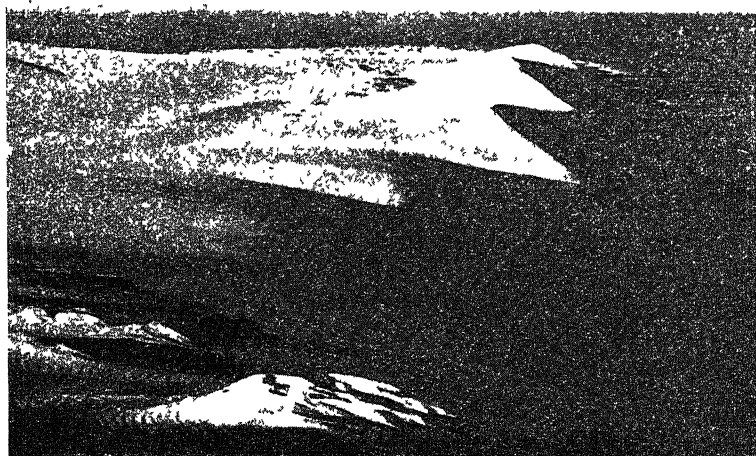
the form of sand. Sand-dunes were erected along the coast and sandspits crowned with dunes (*cordons littoraux*) gradually grew across the mouth of the rivers, since there was practically no tide to scour out the river mouths and keep them clear. The most spectacular of the sandspits (here called *nehrungs*) are the Frische Nehrung and the Kurische Nehrung in East Prussia, but they occur also all along the Pomeranian coast, where most of the rivers now end in lagoons which have no obvious access to the sea. The mouth of the Oder, like the mouth of the Vistula (the latter now mainly in the Free State of Danzig), seems to occupy the site of a glacial "tongue basin" which was occupied for a long time by a lobe of the retreating ice-sheet. The islands at the mouth of the Oder, separating the Haff (lagoon) from the sea, are augmented by *nehrungs*, but have a core of glacial material. Along the coast are a number of small bathing resorts, especially in the section nearest Berlin.

Schleswig-Holstein and the Förden Coast.—While the western part of Schleswig-Holstein belongs to the North Sea coast with its islands, *watten*, *marschen*, and *geest*, the eastern part prolongs the line of the Baltic Heights, though the ground-moraine landscape appears in the eastern peninsulas. Population is concentrated on the east, and the small towns are mainly situated on the coast or at the head of the *förden*, such as Flensburg and Schleswig, but Kiel (218,000) is the only one which possesses deep water. It stands near the entrance of the Kaiser-Wilhelm or Kiel Canal, whose depth of 36 feet enables it to take the largest battleships. It was built by Germany mainly for strategic purposes to connect the North Sea and Baltic through German territory, and so avoid the channels through the Danish islands. Kiel itself has graving-yards and a fishing industry.

The town of Lubeck (129,000), on the river Trave, is a free city like Hamburg, and was formerly the leading member of the Hanse. Its shallow harbour, and in modern days its unfavourable position as compared with the North Sea ports, have caused its decline, though it still carries on trade with the Baltic countries.

The Bodden Coast.—Partly in Mecklenburg and partly in Pomerania, this coast was very greatly dissected, but has been smoothed somewhat by *nehrungs* which have connected islands with each other and with the mainland. A number of old ports which have seen more active days

are situated here, such as Rostock (93,000) and Stralsund. From Warnemunde, the outport of Rostock, a train-ferry service goes to Copenhagen, enabling the journey from Berlin to the Danish capital to be accomplished in ten hours. Stettin (271,000), on the Oder, however, is a larger port than either Rostock or Lubeck, mainly because, like Hamburg, it is fed by a series of great inland waterways. It is connected with Berlin by canal and may be looked upon as the Baltic port of that city. Its main imports are timber, cement, and iron ore from Sweden,



[Courtesy German Railways Bureau, London]

FIG 58 —SAND-DUNES ALONG THE BALTIC COAST OF GERMANY

and its exports consist principally of grain going to that country. It has an important shipbuilding industry

The Coast of East Pomerania, West and East Prussia.—East of the mouth of the Oder there stretches the smooth harbourless coast of East or Further Pomerania (Hinterpommern), until the Bay of Danzig is reached. The narrow Polish Corridor (thirty miles) and the Free City of Danzig cut off East Prussia from the rest of the country. The port of Danzig stands in a comparable position with regard to the Vistula as Stettin does to the Oder and Hamburg to the Elbe, with the disadvantage that the farther east one goes the more is navigation hindered by

ice in winter. Königsberg (316,000), on the River Pregel, was too shallow a harbour for modern vessels, until connected by ship-canal with its outport of Pillau on a *nehrung* outside the Frisches Haff.

The Immediate Hinterland of the Baltic Coast.—This is formed by the ground-moraine belt of Mecklenburg, Pomerania (Pommern), and West and East Prussia. Generally speaking, the soil is a fertile clayey loam, with sandy and gravelly patches, which increase southwards as the end-moraines become more numerous, until the latter dominate the landscape entirely. Wherever the soil allows, the timber has been cleared for sheep and cattle pasture and for cultivation, particularly for vast quantities of potatoes on the sandy soils and for sugar beet on the good loams. Forests increase as one goes south, and the heights themselves are a tangle of woods and lakes, especially in East Prussia. Throughout this Baltic zone of Germany the general density of population is scanty and towns are small and unimportant except for two or three on the coast. The provinces of Mecklenburg, Pomerania, and East Prussia are the domain of large estates, whose origin dates from the mediæval German conquest of this region from the former Slavonic-speaking population. At the present day only a handful of people, known as Masurians, retain their Slavonic speech among the forests and marshes of the end-moraine region of East Prussia.

The Zone of Great Valleys.—This low-lying region presents a series of broad, swampy valleys (*urstromtaler*), running from east to west, and alternating with slightly higher ground composed of dry, generally sandy soils. The present river system has developed valleys at right angles to the old *urstromtaler*, though in some cases the old Ice Age valleys are still utilised by streams, as, for instance, by the lower Havel and Spree. The soil is prevalingly sandy and gravelly, though occasional patches of ground-moraine are found between the *urstromtaler*, and in the valleys there is a considerable amount of alluvium, since the post-glacial sinking of the Baltic coast raised the base-level of erosion and so reduced the gradient of the rivers and increased their liability to flooding. The alluvium itself, however, is often sandy, since it is derived to a large extent from the zone of recent glaciation. The whole region was originally forested and was colonised by the Germans at a relatively late date,

mainly from the fifteenth century and onwards, principally through their efforts at draining the swampy valleys. The *urstromtåler* with their alternation of peat swamp and old heath-covered or wooded sand-dunes must have presented a discouraging picture, but once drained they offered more fertile soil than the sandy stretches between, in whose forests lay the scattered clearings of the original Slavonic-speaking peoples. The names *Altmark*, *Mittelmark*, and *Neumark* indicate the stages of advance of the "march" or border-country of Brandenburg, since the old *mark* (cf. the English phrase "the Welsh Marches") lay west of the Elbe, the middle *mark* between the Elbe and Oder, and the new *mark* east of the Oder. The only remaining Slavonic-speaking group are the 63,000 Wends of the Spree Wald, a region where the Spree has divided into a labyrinth of channels. Although cumbered by old sand-dunes and by later post-glacial alluvial cones which were deposited by the new north-south or south-north flowing rivers, the *urstromtåler* yet lent themselves to utilisation for canals, which have the great advantage of being almost entirely free from locks, such is the lack of gradient from east to west. Not only were these canals important before the railway era, but they are still able to compete with the railways for heavy bulk goods such as coal, timber, building stone, cement, and so on, which are needed especially to supply the city of Berlin.

Apart from Berlin there are no large cities in this region, nor is there any industrial development. Berlin (4,243,000) is the great exception. When the capital of the county of Brandenburg was moved from Brandenburg town eastwards to Berlin at the end of the fifteenth century, only a small settlement existed at a crossing place over the Spree, where the river could be fairly easily bridged owing to the presence of an island. From that time on the town grew with the power of the Electors of Brandenburg, who became also Kings of Prussia in 1701 and Emperors of Germany in 1871. The attainment of its present size of over four millions is very recent, since it had only about 100,000 people at the end of the eighteenth century, whereas London had 865,000 in 1801 and Paris 548,000. Berlin only contained about half a million people at the formation of the Empire in 1871. As in the case of London and Paris, the railway system was made to focus upon the capital city, and the excellence of its communications by rail and water have

helped to foster the growth of a great variety of manufacturing industries, and it is, in fact, like London and Paris, the most important isolated manufacturing centre



[Courtesy German Railways Bureau, London]

FIG 59 —ON THE BANKS OF THE RIVER HAVEL

Note the pine trees and the loose sand visible in the foreground

of its country. Among the multitudinous variety of manufactures, machinery, electrical apparatus, and clothing take a high place. During the present century Berlin has also become the foremost educational and artistic centre of Germany. It is in every respect a modern city, whose recent buildings derive their style from New York.

Brandenburg (64,000) and Frankfurt-am-Oder (76,000) both lie in the same *urstromtal* as Berlin. The latter, an old Hanse town, was built at a crossing-place over the Oder. Its commercial fairs are of considerable importance.

The Southern Ridges.—The Fläming, the much dissected hills of Nieder Lausitz, and the Katzengebirge east of the Oder continue the line of the Luneburger Heide. The last ice-sheet was halted here, probably by the increased elevation, for beneath a relatively thin cover of glacial material are Tertiary sands and clays, together with beds of lignite. The Fläming partakes of the character of the Luneburger Heide, with heath and forest covering its dry, unproductive sands, and so to a less extent do the other heights, which in any case do not exceed 760 feet and would hardly be distinguished as "heights" if the surrounding country were not so flat.

South of these heights lies the southernmost of the *urstromtaler*, occupied in its western part by the Schwarze Elster and farther east by part of the Elbe. On the southern side of this depression the land begins to rise (west of the Oder valley) towards the mountains of the Hercynian system and the whole character of the country changes, though the increase in height is at first only very gradual.

The Silesian Lowlands.—The valley of the Upper Oder may be looked upon as an extension of the North German plain. It lies between the old rocks of the Hercynian highlands (Sudetes) on the west and the Triassic rocks of the Hercynian uplands on the east, and is encroached upon from both sides. It partakes of the nature of the northern lowlands in its agricultural character, though the second largest coalfield of Europe lies on its south-eastern flank, while there is considerable industrial development in the Sudetes also. Like the North German lowlands also, it is the domain of vast estates and has a low density of population.

Lower, *i.e.* northern, Silesia includes the sandy lands of the outermost belt of the young glaciation, and is largely heath-covered, but south of the Katzbach on old glacial

loams are the wide stretches of fertile country which caused Silesia to be one of the main granaries of Germany, growing cereals, especially rye and wheat, and such crops as sugar beet and potatoes. Breslau (625,000) is the centre of this district and the regional capital of the whole of Silesia. The fertile soil is also continued in Upper, *i.e.* southern, Silesia, but only on the west side of the Oder, especially in the loss belt at the foot of the Sudetes. East of the Oder, from the River Stober southwards, are great forests, except where the muschelkalk (Triassic) of the Chelm comes to the surface.

The Silesian coalfield indicates the near presence of the Hercynian system. It was one of the last of the great European coalfields to be developed, owing to its easterly and frontier position on the then frontier of Germany and Russia. It was developed mainly with German capital and by the aid of German experts, but with Polish manual labour. In the midst of deserted forests an important metallurgical industry grew up, with large new towns manufacturing the zinc, lead, and iron ore obtained from the nearby muschelkalk. After 1918 the resuscitated state of Poland laid claim to this coalfield on the grounds of its Polish-speaking majority, but the plebiscite held in 1921 gave 60 per cent of the population in favour of Germany and only 40 per cent for the new and untried state of Poland. Whatever solution had been arrived at would have been unsatisfactory, but the decision to draw the frontier line through the middle would have completely upset the organisation of this industrial region, if the expedient of ignoring the frontier line for such purposes as distribution of electricity, organisation of transport, and movement of workers had not been adopted. The arrangement lasted for a period of fifteen years from the frontier settlement of 1921, but was allowed to lapse in 1936, at the end of the agreed time. Germany retains only a small part of the coalfield, now producing about 16 million tons per annum, with the towns of Beuthen (63,000), Tarnowitz, Gleiwitz, and Hindenburg.

Breslau is not only the commercial centre of a rich agricultural district, but has gained in importance through the development of the Upper Silesian coalfield.

CHAPTER XX

GERMANY (*contd*)—SOUTHERN SECTION

A. THE HERCYNIAN LANDS

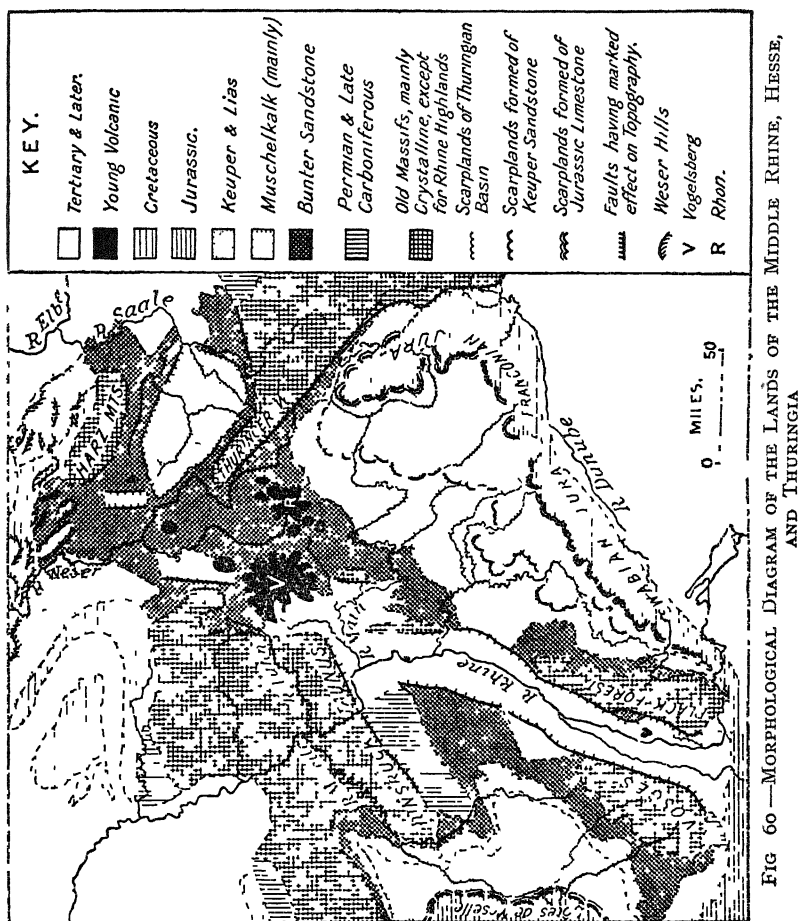
IN contrast to the monotonous and often dreary plains of northern Germany, one enters in central Germany into a region of great diversity. Here smiling plains are backed by wooded hills and mountains; agriculture is more varied, and orchards, vineyards, hops, and tobacco enter into the scene; holdings are small and population dense; old, comfortable-looking farmhouses are met with at every turn; and though manufactures are added to agriculture, as a rule there is no disfigurement of the landscape. In short, this is the old Germany of legend and song, of Holbein and Durer, Beethoven and Goethe. With its picturesque old towns and villages and the well-cared-for appearance of its countryside, it is perhaps more reminiscent of south-eastern England than of any other part of Europe, though to English eyes everything appears exaggerated: the hills are higher and more wooded, the scarps steeper, the plains more fertile, the summers hotter, the winters more snowy, and finally the buildings are more fantastic in style, the Gothic more betimbered and begabled and the Renaissance style definitely Baroque.

This region of Hercynian horsts with the included scarp-lands and plains is often called by German geographers *Die Mittelgebirge*, i.e. "the central mountains."

The Rhinelands.—(i) *The Rift Valley and Bordering Mountains*—Below Basle (German-Swiss, Basel) the Rhine enters a great rift valley, 180 miles long and about 20 miles wide, which is flanked on either side by mountains. Though the French frontier now reaches to the Rhine in Alsace, yet the structure on either side of the river is so similar and the region such an obvious physical unit that it will be treated here as a whole.

The bordering mountains, Vosges and Hardt on the west, and Schwarzwald ("Black Forest") and Odenwald on the east, represent the flanks of an Hercynian horst of which the middle section has dropped, like the keystone of an arch, to form the plain of the rift valley. The horst, which represented the stumps of part of the

Hercynian system, was raised up in mid-Tertiary times, together with the hitherto undisturbed sedimentary rocks of Mesozoic age which had been deposited on top. The collapse of the middle portion between lines of faults



running from north to south took place in late Tertiary times. Evidently the southern part of the horst had been raised to a greater height than the northern portion; consequently erosion was greater in the south and the Mesozoic sedimentaries were removed from the regions of greatest elevation, particularly in the southern Vosges and

southern Schwarzwald, where granites and gneiss were exposed. The greatest heights, however, are still to be found there, the Ballon d'Alsace in the Vosges reaching 4,672 feet and the Feldberg in the Schwarzwald 4,898 feet. Farther north, and on the outer flanks of these mountains, Lower Triassic sandstone, known as Bunter sandstone (Ger., *bunt* = variegated), is found. The same type of rock is called *grès vosgien* in France.

Both the Schwarzwald and Vosges are in places deeply dissected by rejuvenated valleys, without, however, losing the generally rounded forms of the old Tertiary peneplane which existed before the horst was raised. Originally densely forested, much of the land has been cleared, mainly for pasture, though the timber industry remains important. In the Schwarzwald the carving of wooden articles is a considerable home industry in winter, while in the valleys of the Vosges an important cotton industry has grown up.

North of the Schwarzwald is the depression of the Kraichgau, or Neckarbergland, which though higher than the rift valley, contrasts with the forested mountains to north and south, since the muschelkalk which overlies the Bunter sandstone is here preserved and gives a good agricultural soil. Like the similar low-lying Saverne gap north of the Vosges, this break in the mountains is utilised by an express railway line (Paris-Constantinople).

The Odenwald and the Hardt face each other across the northern part of the rift valley. The Odenwald repeats the features of the Black Forest on a smaller scale, with old crystalline rocks on the west and Bunter sandstone on the east, but in the Hardt mountains the old crystalline core is completely covered by the Bunter sandstone, while farther north and west in the Palatinate (Ger., Pfalz) appear Permian and Carboniferous strata, including the coal measures of the Sarre district. These have been preserved in a geosyncline which follows the direction of the strike, which is here from south-west to north-east.

The Saar region, administered by the League of Nations from 1919 to 1935, returned to Germany in the latter year as the result of a plebiscite. The important coal mines, now producing about 11 million tons of coal per annum, were opened up in the midst of a partly forested, partly agricultural countryside and have been greatly developed since 1880, when the value of the Lorraine iron ores became apparent. The marked tectonic depression

of Landstuhl facilitates access between the Saar region and the Rhine Valley, by leading part of the way through the Bunter sandstone region, *via* Kaiserslautern (63,000)



(Courtesy German Railways Bureau, London)

FIG 61 —VIEW IN THE BLACK FOREST

Note the steep rejuvenated valley (the Hollental) in contrast to the smoother slopes of the heights

The rift valley itself was let down between a series of step faults, by means of which strata of the Secondary

epoch have been preserved in the fertile foot-hill zone. It is by no means a simple flood plain, but has a somewhat long and complicated geological history behind it, which accounts for the variety of soils to be found at the surface. During early Tertiary times the rift valley, which opened to the south and had no outlet to the north, was covered by an arm of the sea. This sea gradually became a brackish lake and finally was drained by a river flowing towards the south-west through the present gap of Belfort. In the Pliocene period further earth movement followed, which reversed the drainage, and sent the Rhine northward across the Rhine plateau, which was then presumably at a relatively lower level than at present. The lowering of the base-level of erosion, *i.e.* the increase in the gradient, following on this change, caused much of the Tertiary sediments to be eroded, but dissected Tertiary material is to be found in the hills of Hesse in the north-west and in smaller patches elsewhere on the borders of the plain. The Ice Age caused much of the valley to be covered with infertile gravel and sand brought by torrents from the mountainous borders (as, for instance, between the Ill and the Rhine in Alsace), though the accumulation of löss on and near the foot-hills perhaps more than compensated. The word "loss" itself is apparently of Alsatian origin. Finally, alluvium was spread over the middle and lower part of the valley as the rivers ceased to have erosive power and swung in wide meanders from side to side of the flood-plain. The alluvium is especially thick in the Rheingau, or lower part of the Main valley, where sinking appears to be still in progress.

The rift valley presents, therefore, a surface where dry gravels alternate with swampy alluvium, between a border of loss and other fertile soil. Even volcanic rock (Tertiary) is represented in places, as in the Kaiserstuhl. The gravels generally remain useless and have only a thin covering of poor forest, but the swampy regions have been drained, and these together with the loss and foot-hill zone provide some of the richest agricultural land of Europe. The relatively low latitude (about $47\frac{1}{2}^{\circ}$ to 50° N.) and altitude (mostly below 600 feet) combine to give the rift-valley lands of Baden, Hesse, and Pfalz the best climate to be found in the whole of Germany, mainly because the spring comes earlier and the summers are longer than elsewhere. Nor, in spite of its cold winters, is Alsace surpassed in agricultural richness, even

by the greater plains of France. The typical cultures are wheat, hops, and tobacco, Baden, for instance, being the principal tobacco-manufacturing state of Germany. Sugar beet is also of considerable importance, and along the foot-hills orchards flourish, especially on the eastern side along the so-called Bergstrasse, while vineyards flourish especially on the western side in Alsace, Pfalz, and Hesse, where the slopes have a southerly as well as easterly aspect.

Although the Rhine has been regulated and a straight channel cut through its meanders, yet its former uncertain banks prevented any important settlements from growing up on the river south of Speyer, and even at the present day a deserted swampy zone separates Baden from Alsace. The larger settlements in the southern part of the plain are mainly near the junction with the foot-hills, e.g. Freiburg (99,000), Karlsruhe (153,000), Heidelberg (85,000). Even Strasbourg, the apparent exception, was built away from the Rhine, actually on the River Ill, and has only reached the main river in modern times. Nowadays it stands at the virtual head of navigation on the Rhine, a position formerly held by Mannheim (275,000), which at the junction of the Rhine with the Neckar is still one of the busiest river ports and manufacturing towns of the Rhine rift. The northern part of the Rhine rift has a surprisingly large number of big towns, probably too many under present conditions. Their growth was no doubt favoured by the excellent nodal position of this region, as well

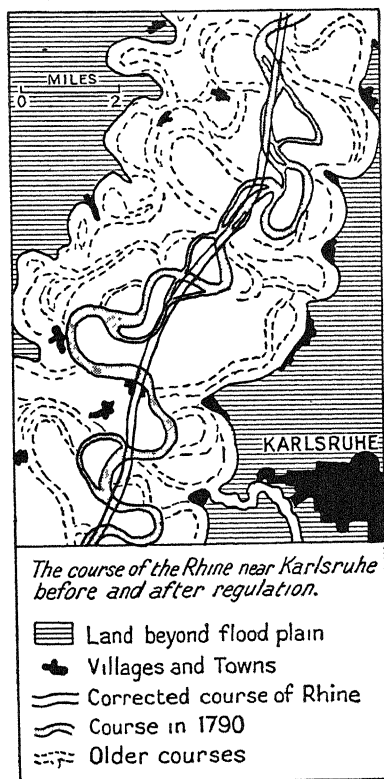


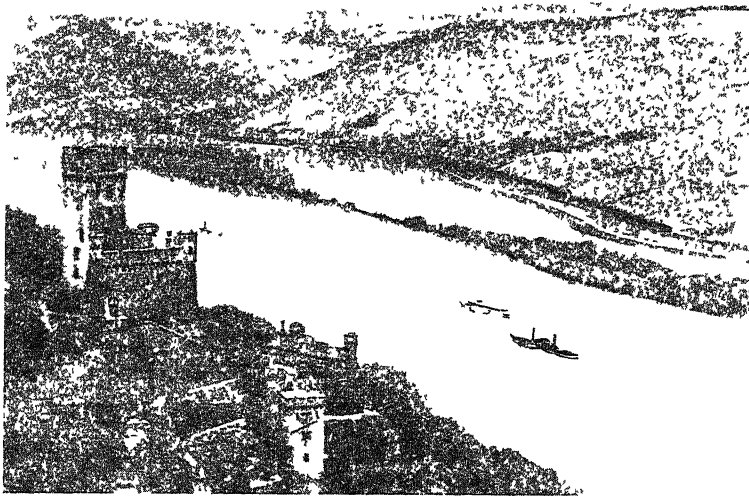
FIG 62—THE COURSE OF THE RHINE
NEAR KARLSRUHE, BEFORE AND
AFTER REGULATION

as by the richness of the soil, but they grew up under different political conditions from those of the present day, at a time when Germany was much divided into different sovereign states, each of which had its own independent capital. At present many of these towns, such as Darmstadt (93,000) and Worms, seem to be stagnating. Even the old Roman foundation of Mainz (143,000), in spite of its busy river port and metallurgical industry, seems to have reached the limit of its growth. Many of the other Rhenish cities have added manufactures to their other activities, owing to the cheapness of transport of coal and other raw material up the great river, *e.g.* Mannheim and its Palatinate rival Ludwigshafen manufacture chemicals, and even Heidelberg, the oldest university town of Germany, has added a manufacturing quarter on the Rhine plain to the west of the old town. Manufactures, especially of machinery, are now carried on in the old banking town of Frankfort-on-Main (Ger., Frankfurt-am-Main; 556,000); also at Karlsruhe, the princely seat of the former rulers of Baden. Only the inland watering town of Wiesbaden (160,000) seems to have held aloof, the very nature of its chief source of livelihood precluding its industrialisation.

North of the Odenwald the line of the eastern bordering highlands breaks down and a continuation of the rift valley takes its place, though the direction of the valley changes and runs here from south-west to north-east. This depression, known as the Frankfurt basin, is occupied by the lower course of the River Main, and it was no doubt once prolonged even farther north until the Tertiary volcano of the Vogelsberg blocked up almost the whole width of the depression, leaving only a narrow strip of lowland in the west. This narrow lowland is known as the Wetterau, and forms a route leading from the Rhine rift valley towards the Weser lowlands and the great northern plain (*see* Fig. 60).

(ii) *The Rhine Plateau*.—Below Mainz the Rhine is confronted by the steep edge of the Rhine Highlands, more properly called a plateau, which lie athwart its valley. After skirting the edge of the plateau for twelve miles or so in the region known as the Rheingau, the Rhine proceeds, from Bingen onwards, to flow through the plateau by means of a gorge some eighty miles long, until just above Bonn it emerges once more on to a plain. The river has here performed the apparently impossible task

of carving its way through a mass of hard, resistant rock whose surface lies at an average height of 1,600 feet above that of the rift valley. Obviously, physical conditions must have been different when the river started to flow across this plateau, and the evidence all points to the fact that we have here another horst which only began to rise in late Tertiary times, after the middle Rhine drainage had been reversed from a southerly to its present northerly direction. The diverted waters of the rift-valley Rhine



[Courtesy German Railways Bureau, London]

FIG 63—SOONECH CASTLE AND THE RHINE GORGE.

Note the flat top of the Rhine Highlands, and the valley sides terraced for vineyards

probably made use of a pre-existing transverse valley across the plateau, but as the horst rose the river had to cut the valley deeper in order to maintain its way. (*Cf.* the passage of the Meuse through the Ardennes, the Elbe through the Erzgebirge.)

The maximum uplift took place in the south, where some of the greatest heights, reaching nearly 3,000 feet, are now found, namely in the Taunus and Hunsrück, just north of the great fault line which marks the southern edge of the massif. Broadly speaking, the horst sinks down towards the north, but it is crossed midway by an old

down-warping running from south-west to north-east and marked by the lower courses of the Moselle (Ger., Mosel) and Lahn, and it rises again in the Eifel, Westerwald, and still more in the Rothaargebirge. The Moselle and Lahn, like the Rhine, have been obliged to incise their valleys in order to maintain their way, and as their lower courses were originally very meandering, the result is a very remarkable series of snake-like twists and turns, especially in the Moselle gorge below Trier (Fr., Trèves). Parts of the valleys of the smaller rivers show similar incised meanders, as in the case of the Ahr and Urft, but generally speaking the old peneplane character has been fairly well preserved over wide stretches of the present plateau, though it is a fossil peneplane, since the Mesozoic and Tertiary material has been almost wholly removed by denudation. Most of the Mesozoic covering had evidently been stripped off by Tertiary times and is preserved only in the Moselle depression round Trier, and the once complete Tertiary covering is preserved only where protected by the young volcanic deposits. The latter accompanied the dislocations associated with the rising horst. Over the greater part of the plateau the old Palæozoic rocks have been exposed once more and consist mainly of slates and shales (Ger., *schiefer*), though the upstanding ridges are usually formed of quartzites, as in the higher parts of the Taunus, Hunsrück, and Rothaargebirge.

The Taunus and Hunsrück are both forest-covered, but the Eifel has been largely cleared and devoted to agriculture, which, however, is so little remunerative that large tracts have gone out of cultivation and returned to moorland, as in the case of the similar " intake " lands of the Pennines. The Eifel district is one of the few districts of Europe outside the Mediterranean zone in which craters and crater-lakes can be seen, the volcanic activity here continuing from Tertiary into geologically recent times. (*Cf.* the Massif Central of France.) The quarrying of hard lavas is a flourishing industry along the Rhine border. The Hohe Venn (= fen) or foreland of the Eifel is a continuation of the Ardennes and is a moorland area with poor pasture and cattle-rearing. Only the Westerwald region of the Rhine Highlands is of any considerable agricultural value, the presence of weathered young volcanic deposits providing a fertile soil, but owing to the raw climate it is used mainly for pasture. The Rothaargebirge and

Siegerland to the north are forested. The old-established iron industry of Siegerland still survives, though the increasing depth and difficulty of mining the iron ore make its production a costly business.

Beyond the Sieg the plateau sinks down to the Sauerland, which, however, is still forested and of little use for agriculture. Like the Siegerland it has some old industries, which have mainly been transformed under the influence of the Ruhr coalfield. (*See* section on the Industrial Border of the Rhine Highlands, p. 252.)

It is in the narrow valleys that most of the life of the Rhine Highlands is concentrated, and as there is practically no floor to these valleys, either along the Rhine gorge or along the lower parts of the Moselle and Lahn, the steep sides have been terraced, wherever a sunny aspect could be obtained, and devoted to vineyards. The most famous German wines, *e.g.* Johannisberger, come from the slopes of the Taunus overlooking the Rheingau. About two-thirds of the German output of wine comes from these valleys, especially the Rhine, Moselle, Lahn, and Ahr, the remaining third coming chiefly from the foot-hills of Hesse and the Palatinate.

The Rhine gorge, in spite of its narrowness, is one of the busiest highways of movement in Europe. Railways follow both banks, while great barge-trains dragged by powerful tugs animate the river. The Rhine gorge from Bonn to Bingen presents a piquant contrast with its romantic castle-crowned crags frowning down upon the bustling modern world at their feet. Between Bonn and Coblenz, the confluence town, where the Moselle joins the Rhine, factories of various kinds are rarely out of sight and villages succeed each other almost without a break. Even in the more unspoilt stretch between Coblenz and Bingen a modern Lorelei would find the sirens and smoke of passing tugs a sad hindrance to her singing. Not only does the Rhine valley give a short, direct north-to-south international route through the Hercynian mountain systems of central Europe, but the richness in agriculture or minerals of the lands on either side further contribute to the amount of traffic, a good deal of which is carried on the navigable Rhine itself. No river in Europe can compete in the amount of traffic carried, although the Rhine has by no means the longest navigable course, being far behind the Volga and Danube in that respect. The main contributor to this traffic

is the Westphalian industrial area which lies on the northern border of the Rhine Highlands

(iii) *The Industrial Border of the Rhine Highlands*.—The Rhine gorge opens out by the volcanic hills of the Siebengebirge just above Bonn, into the lowland bay of Cologne (Ger., Köln), and the Rhine plateau sinks down gently into the plain on either hand. It is on the borders of the plateau to the east of the Rhine and in the Cologne bay of lowland that the great industrial development has taken place which has transformed the countryside in the last sixty years or so. Some of the industries, to be sure, date from much earlier times, but even these have been given new life and many others called into being by the development on the border of the Rhine plateau of a great coalfield. This is usually known as the Ruhr or the Westphalian coalfield, though it extends northward beyond the Ruhr valley and westward beyond the limits of Westphalia into the Rhine province.

The Ruhr coalfield has a greater output than any other in Europe and probably greater reserves even than the Silesian coalfield, its only rival on the Continent. Its exploitation is more recent than that of the great coalfields of the British Isles, which stand next to it in output, since it produced only about $2\frac{1}{2}$ million tons in 1850 and less than 12 million tons in 1870, whereas the Yorks, Derby, and Notts coalfield was producing 10·8 million tons even by 1855. It had therefore the advantage of being able to profit by the experiments of others in regard to technique, not only in the actual mining, but in the development of industries dependent upon coal.

For some years before the Great War the annual production averaged about 100 million tons, or about 60 per cent. of the total German output. In 1937 the output was 128 million tons out of a total of 185 million tons.

Like the mines of Great Britain, and in contrast to those of France and Belgium, the coal measures are little disturbed except by occasional faults and gentle warping, and are fairly easy to work. The coal measures were apparently slightly tilted by the Tertiary uplift of the Rhine plateau, and the upper measures, as well as the covering mantle of later material, were denuded from the southern part of the field, so that here the coal actually outcrops in the valleys. It was therefore easily worked in the early days by means of adits and shallow mines, but this coal is not of such good quality as that obtained north of the

Ruhr River. The coal measures gradually sink northward under a mantle of Secondary, Tertiary, and recent material, and the northern limits of the coalfield have not yet been ascertained, though mines are worked at a depth of more than 4,900 feet near Munster. As the coal measures sink northward, the depth of the overlying rocks becomes greater, but at the same time the coal measures themselves increase in thickness, and coals of ever richer quality are added to the stratigraphical sequence, having escaped the denudation which removed them farther south, so that on top of the poor coals of the Sauerland border come coking coals along the Ruhr valley, on top of these farther north come gas coals, and lastly north of the Emscher come long-flame coals (see Fig. 64).

The working of this coalfield has given rise to a great "black country" some fifty miles long from east to west by ten miles wide from north to south, which is ever extending northwards and devouring more of the agricultural countryside as newer and deeper mines are opened. The main industrial area, which lies north of the River Ruhr and stretches from Duisburg (440,000) to Dortmund (541,000), contains about five million people and forms in reality a single conurbation, there being practically no break in the continuity of houses and

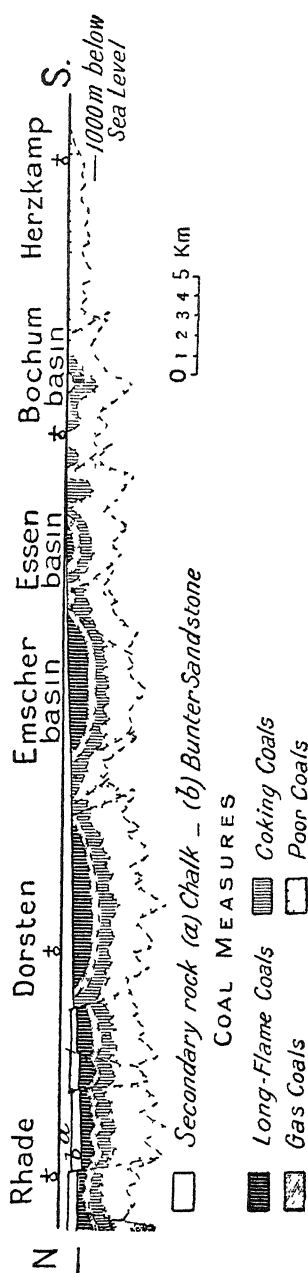


FIG 64.—SECTION ACROSS THE WESTPHALIAN COALFIELD

factories, though the names of Essen (654,000), Gelsenkirchen (333,000), and Bochum (315,000) may be mentioned among the more important urban centres.

Apart from the actual mining, the chief form of industry is the manufacture of heavy iron and steel goods of all kinds, including the preliminary manufacture of coke and pig-iron. The iron ore now has to be imported, as Germany's own resources in this raw material are small, the insufficient and expensive Siegerland ores, already mentioned, being her chief home supplies. Even before the loss of the Lorraine ores millions of tons of iron had to be imported, and in 1934 some 5 million tons (60 per cent.) were supplied by Sweden, 1.6 million by Lorraine (20 per cent.), and smaller amounts by Spain, North Africa (Algeria and Tunisia), and Austria. Needless to say, the position on the plain renders the transport of this heavy raw material a relatively easy matter, and river, canal, and rail supplement each other in the supply and distribution of raw materials and manufactured goods. Heavy goods travelling in bulk, such as imported iron ore and imported grain, travel principally by water, with the exception of the Lorraine ores, which must go by train, as the meanders of the Moselle make navigation prohibitively tedious. The large amounts of coal and coke sent away from the Ruhr also utilise the waterways, particularly the canalised Ruhr and Emscher, which penetrate the heart of the coalfield, and the Rhine itself, both downstream towards Holland and upstream to the middle Rhine valley and the adjacent lands. The twin port of Duisburg-Ruhrort on the Rhine forms not only the most important river port of Germany, but also of Europe, with a tonnage exceeding that of Hamburg. It is concerned with the transshipment of coal outwards, and iron ore, grain and petroleum inwards, either on to the Herne canal and River Ruhr or on to the railway and *vice versa*.

The manufacturing towns of the middle Rhine have already been mentioned as being principally supplied with raw materials from the Ruhr coalfield, but closer at hand are a number of other manufacturing cities, which though not on the coalfield itself may be taken as satellites of the main industrial region. Such are the textile towns of Elberfeld-Barmen, Crefeld, and Munchen-Gladbach, the river port of Düsseldorf, which manufactures machinery and chemicals, and the cutlery towns of Remscheid and Solingen. Elberfeld and Barmen, which

now make one conurbation of 405,000 people hemmed in along the narrow incised valley of the Wupper in the Sauerland plateau, were noted for their textiles long before the exploitation of the coalfield began, for the clear soft waters of this Sauerland stream provided both power and the necessary water for washing and dyeing. Crefeld (Ger., Krefeld; 165,000) is also a fairly old textile centre chiefly noted for its silk, but now, like its neighbours, manufacturing also cotton and rayon. Solingen (140,000) and Remscheid (101,000), on the Sauerland plateau on either side of the Wupper, form jointly the Sheffield of Germany and have long been noted for their cutlery and fine steels, but in recent years have added all kinds of hardware and "Birmingham" ware. Formerly they exploited small local iron ores which were smelted by charcoal, but they now derive their pig-iron or bar-steel from the Ruhr area. Of these towns, Dusseldorf is the most important as regards commercial and cultural influence.

For all this region the commercial capital is the old Roman foundation of Cologne (Ger., Köln), though its 757,000 inhabitants are to a large extent also dependent on manufactures. Its nodal position, where the Rhine river route crossed an east-west land route skirting the Rhine plateau, was obviously an important factor in its rise and development, but although it flourished in Roman times and still more in mediæval times, with the overland trade in eastern and Mediterranean commodities, its modern growth dates from the development of the Ruhr coalfield, for in 1871 it was still a comparatively small city of 80,000 people. A good deal of the capital for the early mines and industries of the Ruhr district was supplied by Cologne, which thereby added to the field of its commerce. Of recent years the fuel wealth of the northern Rhinelands has been increased by the large-scale working of Tertiary lignite at the very doors of Cologne itself in a mining area which extends as far as Bonn. Though it may seem an *embarras de richesse* in view of the Ruhr coal, yet this is not so, for since the lignite is practically on the surface and therefore easy to mine, it forms a cheap source of electrical power, thereby freeing the coal for other purposes.

Standing somewhat aloof from the industrial area dependent on the Ruhr coalfield is the woollen manufacturing centre of Aachen (Aix-la-Chapelle, 163,000), on a little coalfield of its own, which is situated, like the Ruhr

coalfield, at the foot of the Rhine plateau. Its mineral springs were known to the Romans.

(1v) *The Lowland of Munster*.—The lowland bay of Munster may be looked upon as an Hercynian basin covered in parts by glacial deposits, and it is therefore transitional between the Hercynian region of middle Germany and the northern plain. On its eastern and southern borders the chalk outcrops, in the middle of the basin are Tertiary deposits, mainly marls, while on the northern edge are glacial sands. The region was almost wholly agricultural until the discovery of the underlying coal measures, but industry is gradually creeping into it along the Dortmund–Ems canal, and also owing to the sinking of mine shafts in the south. Munster (122,000) is the regional capital and has some agricultural industries.

The Mittelgebirge between the Rhinelands and Bohemia.

—(1) *The Scarplands of Swabia and Franconia* —This region, which is drained mainly by the Neckar and Main tributaries of the Rhine, has in broad outline a symmetrical and simple structure. Strata of Triassic and Jurassic age have been tilted up towards the north-west and exposed to denudation, so that the younger rocks have been stripped off and progressively older layers have been exposed, the younger rocks remaining in the south-east. The edges of the more resistant rocks stand out as scarps, which face westwards or north-westwards (*see* Fig 60).

The geological formations fan out, as it were, from the south-eastern corner of the Schwarzwald, between the old horsts on the west and the Alpine Foreland on the south-east. Starting from the north-west, the Bunter sandstone of the Lower Triassic has already been mentioned as covering the infertile forested eastern slopes of the Schwarzwald, Odenwald, and Spessart*. This is succeeded by the Middle Triassic measures, mainly represented here by the muschelkalk, a shelly limestone, which together with the Keuper marls (Upper Triassic) which succeed it eastward form the highly cultivated *Gau* country, though the fertility is largely to be attributed to old river alluvium which overlies both formations and which resembles loess in its appearance and properties. Bordering these plains eastward is the scarp-line formed by the edge of the Upper Triassic sandstone (*Stubensandstein*), a scarp which has an exceedingly discontinuous and uneven front, especially in the south-west of Swabia, but is somewhat more regular, though lower, farther north in the Frankenhohe and Steigerwald of Franconia. In places this scarp reaches

600 feet above the plain, but is usually only half that height and so irregular that its character is often difficult to perceive on the ground. This sandstone formation of the Upper Trias quickly sinks in Swabia under Liassic marls which again offer very fertile soils, but in Franconia the sandstone outcrops over a wide area and presents a sterile soil mainly under pine forests, and the Lias belt is very narrow. Above the Lias beds rises the very considerable scarp of the Swabian and Franconian Jura,¹ formed principally by hard white limestones, but even this scarp is not continuous, being interrupted, *e.g.* by the depression of the Ries between the Swabian and Franconian sections, and although the edge sometimes attains a height of a thousand feet or so above the plain, yet it is considerably frayed by erosion. Outliers often stand in front of the main scarp and are often crowned by castles, *e.g.* the castle of Hohenzollern. The limestone of the Jura forms a plateau of considerable elevation, the true *Alb*. Owing to a fracture it sinks rather rapidly on the southern side under the Tertiary and glacial accumulations of the Alpine Foreland.

The river system of the scarplands is particularly complex, owing to the fact that there has been a considerable reversal of drainage. The rivers in early Tertiary times apparently flowed down the dip-slope towards the Danube, but the development of the Rhine rift attracted drainage in that direction, as the floor of the rift is several hundred feet lower than the upper Danube valley. Accordingly a complicated system of river capture took place, which accounts for the numerous elbows of capture. Naturally, also, the introduction of a lower base-level of erosion led to the incising of the rivers in their valleys, whose somewhat steep sides, often devoted to vineyards, recall the Moselle valley in miniature. The earlier Tertiary peneplane surfaces, however, have not as yet been greatly affected by erosion, hence the generally level appearance of the country and the survival of old river alluvium.

The scarpland region is not very low-lying, even the *Gauze* plains are at a height of nearly 1,000 feet above sea-level, and the *Alb* reaches over 3,000 feet in the south-west, though it is under 2,000 feet in the north. The relatively southerly latitude, however, from 48° N. to 50° N., together with the protection offered to the plains by the Schwarzwald, Odenwald, and Spessart give the lower

¹ The name Jura is being superseded in Germany by the old local term *Alb*.

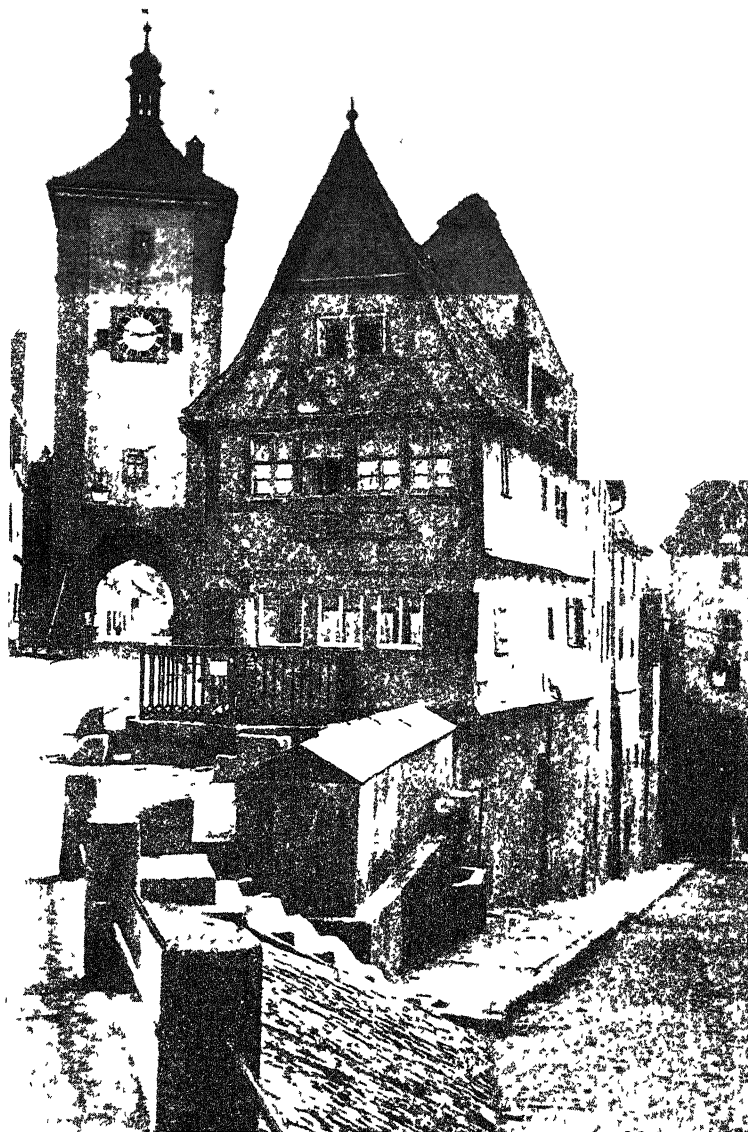
lands a favourable climate in which wheat, orchards, and tobacco all flourish, and the vine and maize succeed in favoured places. Even the *Alb* plateau, though possessing a raw climate (*cf.* the *Rauhe Alb* of the Swabian Jura), is mainly arable, though there is a difficulty in obtaining water owing to the depth of the water table.

Minerals are scarce in the scarplands, but the lithographic stone or Solnhofen slate of the Franconian Jura may be mentioned, as it is still used to some extent. Small deposits of iron ore are found in the Dogger sandstone of the Jurassic system, but are no longer of importance, and salt and gypsum are found in the Keuper series (*cf.* Cheshire salt mines).

The old towns of this region are numerous and beautiful. In the Middle Ages they were partly local market towns, but were also active participators in the trade that crossed Europe from the Mediterranean to the North Sea lands. Hand industries were important, especially the metal industry, and also textiles, working chiefly flax.

With the coming of railways in modern times modern industries have been established, in spite of the absence of coal and raw material, but naturally the heavy industries are not represented. The agricultural produce of the country is manufactured to some extent, and still more, such articles which take little raw material but are of high value when finished, such as textiles, leather goods, machinery, watches, optical and musical instruments. The industrial centres have generally remained rather small and are localised chiefly in Swabia (modern Württemberg), along the middle Neckar valley and at the foot of the *Alb* in the same neighbourhood. Stuttgart is the centre of the Neckar industrial region, which extends principally between Heilbronn and Plochingen, and the line is continued up the Fils valley from Goppingen to Geislingen. Stuttgart (415,000) is the only large town, and though it owed its foundation by the rulers of Württemberg to its pleasant site on the *stübensandstein* scarp, yet with the advent of the railway it became the main seat of industry in the south-western scarplands.

In the Franconian or north-eastern section of the scarplands Nuremberg (Ger., Nürnberg; 410,000), together with its suburb Fürth (77,000), concentrate most of the industrial development. Its manufactures are very varied, but metallurgical products take first place, and include machinery, motor-cars, bicycles. In spite of its large size



[Courtesy German Railways Bureau, London.]

FIG 65—VIEW IN ROTHENBURG ON THE TAUBER

One of the many small picturesque towns of the Swabian and Franconian Scarplands

the city has managed to retain much of its picturesque mediæval appearance, which recalls the fame of the city through its mediæval trade with Venice and through its remarkable sixteenth-century metalwork. It naturally attracts many tourists, who also flock to the other old towns of Franconia, of which Rothenburg is perhaps the most picturesque

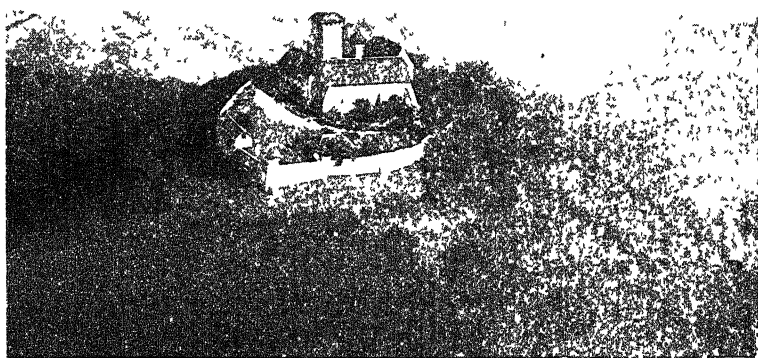
Owing to the smaller industrial development and the wider outcrop of the poor *stubensandstein*, Franconia has fewer people per square mile than Swabia. The loam-covered lands of Swabia seem to have had only a scanty forest cover in neolithic times and to have early attracted a settled population. Like the Rhinelands Swabia was inside the Roman Empire. It was the land of the Suevi and Allemanni, and from many points of view may be looked upon as the homeland of the German-speaking people.

(11) *The Uplands and Plains of Hesse and Thuringia.*—This region of forested uplands and narrow but fertile plains seems at first sight a patternless mosaic of small land-forms. It does, however, represent the continuation both of the Rhinelands and of the scarplands, but the symmetry is disturbed by Tertiary volcanic outpourings, by complicated faulting, and in the north even by considerable folding (see Fig 60).

The Hessian Lands.—In the west these lands are bordered by the Rhine massif, east of which lies the continuation of the Rhine rift valley known as the Wetterau (see section on Rhine Rift Valley). Though interrupted by the dissected volcano of the Vogelsberg, the rift is continued still farther northwards towards Kassel (172,000) on the Fulda tributary of the Weser. An important routeway skirting the Vogelsberg is afforded by this rift, which like that of the middle Rhine is filled with Tertiary deposits, generally of considerable fertility.

East of the rift the main floor of this region is formed by Bunter sandstone, thereby continuing the line of the Odenwald and Spessart. The sandstone, as usual, provides but a poor soil and has been left under dense forests. Occasionally, however, cappings of Keuper marl remain, as, for instance, to north and south of the volcanic Rhöngebirge (3,117 ft.) and north-east of the Teutoburger Wald, and these afford better soil. The river valleys are also fertile, besides offering routeways, e.g. the River Fulda with the town of Fulda between the Vogelsberg and Rhöngebirge.

Thuringia.—The salient of the Thuringian Forest (Ger , Thuringer Wald) acts as a separating wall to some extent between the uplands of Hesse and the rather lower and more fertile lands of the Thuringian basin to the east, the latter having some unity through being drained by the River Saale and its tributaries. The Thuringer Wald itself is a typical Hercynian horst and is bounded to north-east and south-west by fault-lines. It reaches a height of just over 3,000 feet and, as its name implies,



[Courtesy German Railway, Photo Tourist]

FIG. 66 —WACHSENBURG NEAR HOLZHAUSEN, THURINGIA

The castle-crowned crag, overlooking highly cultivated, hedgeless and treeless plains, presents a scene very characteristic of Thuringia and Hesse

is heavily forested. In spite of this apparently unfavourable environment it supports a considerable population, which is engaged mainly in manufactures demanding much skill and patience, such as fine metallurgical work, glass-work and porcelain for medical use (thermometers, etc.), and the well-known dolls' heads. The population was formerly dependent upon local iron and copper mining and working, and turned to other forms of industry as these deposits became exhausted.

North-east of the Thuringer Wald lies the structural basin of Thuringia. Here are preserved the muschelkalk

and Keuper beds and in places also even Jurassic and Cretaceous rocks. The muschelkalk forms a low and much interrupted scarp, facing outwards almost all round the edges of the basin, but the structural harmony of the basin itself has been disturbed by dislocations and flexures caused by the pressure of the adjacent horsts. The basin provides rich agricultural land and possesses several cities of fair size. Erfurt (145,000), the largest, is a commercial and industrial city, with somewhat the same industries as those of the Thuringer Wald, Weimar (46,000), associated with Goethe and Schiller, and Gotha (45,000), with its well-known geographical establishment, remain small. Jena (58,000) is famed for its optical instruments and its university.

The rest of the country between the Thuringer Wald and the Harz Mountains is mainly covered by the infertile Bunter sandstone, but the Goldene Aue is a little rift valley in which fertile Tertiary deposits are preserved and which is renowned for its rich agriculture.

The isolated Hercynian horst of the Harz Mountains still largely retains its peneplane character. About half the area remains under forest, the rest of its mainly undulating surface being cultivated for hardy crops, such as hay and potatoes. A considerable number of small towns on the margins carry on industries somewhat similar to those of the Thuringer Wald and present a somewhat similar history of a population formerly engaged in mining, here mainly for silver, who turned to manufacturing as the mines failed. Copper is still worked near Eisleben on the eastern side of the Harz.

Bordering the Hesse-Thuringian uplands on the north are a number of short, low chains, which represent earth ripples connected with the re-elevation of the Hercynian horsts. Little denuded anticlines are frequent, like those of our own Weald, and of similar late Secondary or early Tertiary date, with the muschelkalk, Jurassic or Cretaceous limestones standing up above the clays and marls exposed at their feet. These little chains extend on either side of Minden on the Weser, which cuts through them at the Porta Westfalica.

The Borders of the Bohemian Massif.—The German frontier on the south-east runs along the mountains bordering the Bohemian basin. The Bohemian Forest (Ger., Bohmer Wald) on the south-west of that basin presents its steep side to the Regen valley and is a scantily

peopled forested region of rounded mountains composed of granites and gneisses. The gap of Furth, traversed by rail, separates it from the Forest of the Upper Palatinate (Oberpfalzerwald), which is somewhat lower and less desolate. Between these mountains and the Franconian Jura lies the hilly basin of the Upper Palatinate, drained by the River Naab. The basin is a denuded anticline. The considerable elevation of the basin (mainly over 1,300 feet) combined with the heavy rainfall and heavy soils, derived mainly from Keuper marls and Lower Cretaceous clays, conspire to produce a pastoral country with considerable forest.

The Erzgebirge and their German foreland present a contrasting picture to the above. In this case the main fault-lines and the abrupt descent are on the Bohemian side and there is a gradual ascent from Germany. The name Erzgebirge ("Ore Mountains") indicates the considerable metallic wealth of silver, copper, and lead which formerly attracted a German population on to the heights, though these ores are no longer profitable to work. The lower slopes were cleared for agriculture, but the main riches of this area at the present day lie in its manufactures. A small coalfield lies near Zwickau (85,000) and an even smaller one near Dresden, but the manufactures now are more dependent on electricity—derived mainly from lignite—and in origin pre-date the extensive use of coal and steam-power. The main industry is the textile, which has developed out of an old hand industry, which in turn seems to have been adopted as a supplementary means of livelihood in a somewhat over-populated district. Wool was the principal textile originally, and the merino sheep of Saxony, introduced from Spain in the eighteenth century, were among the ancestors of the present flocks in Australia. Chemnitz (351,000), often called the "Manchester" of Germany, is the great centre of the industry, which now includes cotton, linen, jute, and artificial silk, but the industry is also widely diffused throughout the countryside of the Erzgebirge and Vogtland, and in the angle between them, factories being found in many small towns and villages. A large number of home looms still persist, though they are now mainly driven by electricity, as in the textile region of the French Massif Central round St. Etienne. Plauen (114,000) and district rival St. Gallen in Switzerland for embroideries. Metallurgical work of the finer kind, particularly the

manufacture of machinery, including textile machinery, takes second place

In some respects this industrial region of the former kingdom of Saxony may be looked upon as forming part of a greater region, which includes the Leipzig bay of lowland lying mainly in the Prussian province of Saxony, though the genesis of their industrial development was different. Agriculturally the northern and lower parts of the "kingdom" of Saxony continue the wheat and sugar-beet lands on the loss belt already mentioned as bordering the north German plain.

The city of Dresden on the Elbe owes a good deal to the kings of Saxony, who made it their royal residence. It has, however, reached its present size (642,000) through its commercial and economic activities, which include textile, metallurgical, and optical manufactures, though the famous Dresden china was made at Meissen farther down the Elbe.

The River Elbe breaks through the mountain border of Bohemia into Germany *via* a zone of structural weakness, where the old crystalline core had been downfaulted before Cretaceous times, and the depression filled in by a great thickness of Cretaceous clays and sandstones, which have here been preserved. The upper layer of sandstone has often weathered into fantastic forms, particularly into stacks or pillars of rock, which have given rise to the exaggerated and misleading title of "Saxon Switzerland."

The Sudetes is a much more complex region than the relatively simple horsts of the Bohmer Wald and Erzgebirge. The area may be looked upon as being much fractured by faults, and instead of a single large horst, there are a number of small horsts between which lie basins where the Permian and later strata have been preserved. The highest part lies in the north, where the Riesengebirge ("Giant Mountains") rise above the tree limit, the Schneekoppe being above 5,000 feet. The most important basin is that of Waldenburg, where coal measures are preserved, yielding about $5\frac{1}{2}$ million tons per annum. This source of power gave fresh life to the textile industries of linen and wool which had already been established. A small metallurgical industry also exists.

B. THE ALPINE FORELAND IN GERMANY

This is a continuation on a larger scale of the Alpine Foreland in Switzerland and Austria. The geosyncline to the north of the Alps has been filled in by masses of

material known as *molasse*, which was weathered from the great chain during Tertiary times, and by the products of later erosion, especially during the great Ice Age. The Foreland generally forms a plateau of little relief, which though about 1,000 to 3,000 feet above sea-level, has often the appearance of a plain, though it is dissected into hills in the north-east.

West of the River Lech the plateau is narrow and the *molasse* has been completely covered by glacial material, mainly gravels. In the southern part the impress of the most recent glaciation is still very clear, and tongue-basins with morainic walls and outwash plains are common. The soils are generally poor, and the climate owing to the elevation and northward slope is cold and wet, so that agriculture is confined to hardy crops and pasture, and considerable areas are forest-covered.

East of the Lech young glacial material and glacial land-forms, including tongue-basins, are found in the south, older glacial gravels appear in the middle, and the *molasse* at the surface farther north. The *molasse* has been slightly dissected by the rivers into hills, and its fairly fertile though heavy soils give rise to considerable agriculture. The middle zone of gravels bears large stretches of swamp, forests, and heathlands. It is in this unfavourable zone that Munich (Ger., Munchen; 735,000) is found. Like so many German cities, it owed its growth to princely caprice, being chosen as capital and royal residence by the rulers of Bavaria (note its repute as a musical and artistic centre), but its present size is mainly due to its industrial and commercial development. It is the largest city of southern Germany, and apart from Augsburg it is also the only great city of this extensive natural region of the German Alpine Foreland, which is generally lacking in raw materials and labour, and also in motive power, apart from water. Such industries as exist are concentrated in the towns, particularly in Munich, which to an old brewing industry has added electrical, textile, and mechanical industries. Munich is also well known as a centre for technical education.

Augsburg (177,000), at the confluence of the Lech and the Wertach, was a well-established town dating from Roman times when Munich was a mere crossing-place on the Isar for the salt route from Salzburg. It enjoyed great prosperity in mediæval times as a trading city connected with the forwarding of eastern goods from the

Mediterranean *via* the Brenner and Fern passes from Venice and *via* the Bundner pass from Genoa, but it has suffered in modern times from the attractions of its rival and neighbour

Economic Summary.—Germany is the most highly industrialised country of Europe with the exception of Great Britain, though this development is comparatively recent and dates mainly from the unification of the German states into the *Reich* or Empire in 1871. Fifty per cent. of the employed population is engaged in industry and commerce, and only 30 per cent. in agriculture and forestry. This industrial development is based chiefly on the large resources of bituminous coal, lignite, common and potash salts, and iron ore

Germany's coal reserves were the greatest in Europe in 1913 and amounted to about 40 per cent. of the total for the whole continent, whereas those of the United Kingdom were about 34 per cent. With the loss of part of the Silesian coalfield to Poland the reserves now amount to about 24 per cent. In regard to the output of coal, Germany has held the second place in Europe and the third in the world since the formation of the *Reich*, the output amounting to 190 million tons of bituminous coal in 1913 and 185 million tons in 1937. The abnormal post-war disturbances and world-wide depression brought about a heavy reduction in the output after 1918. The output of lignite, however, increased from 87 million tons in 1913 to 137 million in 1934, and 161 million in 1936, and this fuel is largely used for conversion into electrical energy. In addition, hydro-electricity has been developed on a large scale since 1918, over a million horse-power being now available. Germany's salt deposits have also been of great value in the development of modern manufactures, particularly the chemical industry, in which before 1914 Germany held the leading European position, since challenged by Great Britain. Eleven million tons of potash salt and three million tons of common salt were produced in 1936. Before the Great War no other country in Europe had any considerable supplies of potash salts, only two sources of supply being known, that of Stassfurt and that of Alsace, but the German monopoly was broken with the return of Alsace to France. Since the War, also, Germany's resources in iron ore have been much reduced, as these were mainly situated in Lorraine, part of which had been seized by Germany in 1871,

but was surrendered in 1919. The output of iron ore in 1936 amounted to 7.6 million tons, as against 28 million tons in 1913, so that Germany, like Great Britain, now has to import large quantities of iron ore. Germany in 1937 was the chief European producer of pig-iron. Zinc and copper occur in considerable quantities, but Germany's superior natural endowment is mainly in the form of motive power, in which respect the country is probably the richest in Europe, if lignite and water-power are taken into consideration as well as bituminous coal. (See Appendices C, D, and E.)

Apart from mining and the heavy iron industries, the most important branch of industry is the metallurgical, including the making of machinery, shipbuilding, cutlery and fine steels, and electrical, optical, and surgical instruments. The important chemical industry, which includes the manufacture of dye-stuffs, artificial fertilisers, and many other products, has already been mentioned. Glass-making is also of considerable importance.

As regards textiles, Germany is not in such a dominating position as in the metal industries, but nevertheless holds a high place among European producers. In amount of raw cotton manufactured in 1933-4 it held third place in Europe, with a consumption of 1.5 million bales, Russia holding second place with 1.9 million bales, and Great Britain first with 2.5 million bales. (But *see also* Appendix F., p. 412.)

The manufacture of the agricultural and forest products of the country is widely disseminated and of considerable importance, principally for the home market. There is an export of sugar, however, from home-grown sugar beet, as Germany is the leading producer of beet-sugar in the world and has a surplus available after the local needs are supplied.

With the development of industries, however, the Germans have not neglected the agricultural and forestry resources of the country. Sixty-one per cent of the total area is under cultivation, of which five-sevenths is arable, while twenty-seven per cent. is under forests, the latter being noted for the excellent way in which they are managed. Owing to the large numbers of industrial workers, however, Germany is not self-sufficing in food-stuffs, but can almost become so in the emergency of war.

German exports consist almost entirely of manufactured goods, principally iron and steel goods, textiles, coal, chemical products, paper, dyestuffs, copper goods,

and glass ware. The imports are mainly foodstuffs, such as coffee, butter, and wheat, and raw materials, such as raw cotton and wool, mineral oil, coal, copper, timber, and iron ore.

REFERENCES

Deutschland, by G Braun (Berlin, 1916), is the best modern textbook by a single author. A much enlarged edition was published in 5 parts in 1926-1936. The compilation *Deutschland* in the *E von Seydlitz'sche Geographie, Hundertjahr-Ausgabe* (Breslau, 1925), is also good and contains a profusion of photographs and diagrams. J Walther's *Geologie Deutschlands* (2nd edn, 1912) is a standard work.

The following series is highly recommended: *Landeskunde von Deutschland*, edited by N Krebs, 4 vols (Berlin), *Der Nordosten*, by B Brandt (1931), *Der Sudwesten*, by N Krebs (1931), *Der Nordwesten*, by Hans Schrepfer (1935), *Der Sudosten*, by F Metz.

The topographic maps on the scale of 1 : 100,000 (coloured edition) are good as far as they are available. An excellent new series on the scale of 1 : 50,000 is in course of preparation.

CHAPTER XXI

POLAND

Historical Foreword.—It is impossible to understand the geography of Poland without knowing something of the main events in its history. Between the years 1795 and 1919 there was no independent state of Poland, except for the Grandduchy of Warsaw, 1807–1815, and the small republic of Cracow, 1815–1846, and the land was divided between Russia, Germany, and Austria. Before the partitions of 1772, 1793, and 1795, the kingdom of Poland had had a long tradition behind it, dating back to the tenth century, and the country had acted for centuries as one of the bulwarks of western Europe against invasions of Tartars, Turks, and other such people from the south-eastern steppes. Even as late as 1683 a king of Poland (John Sobieski) came to the rescue of Austria and Christendom when the city of Vienna was closely besieged by the Turks and seemed doomed to capitulate. The rôle of Poland, however, was not only defensive. It is useful to notice here the general forward movement towards the east on the part of all the great nations of the plains north of the Alps. The French aimed at reaching the Rhine, the Germans (Austrians, Prussians, and others) pushed forward among the Slavonic-speaking peoples, and in turn the Poles advanced still farther east into territory which was inhabited by Russians. A word of explanation is necessary to show how this came about.

It happened that from the fourteenth century onwards Poland was a dual monarchy, its heiress having married the ruler of its eastern neighbour, the Grandduchy of Lithuania. The latter state had previously extended its rule south-eastwards over large numbers of people who were not Lithuanians, but who spoke Russian dialects and were known as White Russians and Ruthenians, the latter sometimes called Ukrainians. In the former Grandduchy the Poles had a favoured position, partly on account of Poland being the dominant partner and partly on account of their superior culture, and Polish nobles became overlords over large tracts of land, Polish traders became numerous in the towns, and Polish became the language of

the educated. To a less extent Poland proper had also expanded towards the south-east to include the Ruthenians of East Galicia.

From the beginning of its history Poland represented ideas—later crystallised into tradition—which were neither German nor Russian. Although the Poles and Russians both speak Slavonic languages, yet the two peoples derived their civilisation from the Mediterranean by different roads, Russia *via* Constantinople and Poland from Italy, and this gave the two countries a different bias from the start. Poland, on the other hand, though welcoming German settlers at one time, was thrown on the defensive against German ideas owing to the aggressiveness of Prussia, which, moreover, was a Protestant state from the sixteenth century onwards, while Poland remained Roman Catholic.

With the collapse of Russia and the Central Powers towards the end of the Great War of 1914–1918, it became possible for Poland to be reconstituted, but the hundred years, and more of partition had left their mark and accentuated the differences already existing between eastern and western Poland. This hundred years had been one of great change in western Europe, but by far the greater part of the former kingdom of Poland was under Russian rule during that period and shared in the relative stagnation of the latter country. Even in the west, in Poznań and Upper Silesia, though great economic progress was made, the large landowners were mainly German and there was a lack of Polish leadership which alone could have brought about a vigorous improvement in education and in the general standard of living. Whether such leaders would necessarily have come forward is, of course, in itself doubtful, as Poland's collapse at the end of the eighteenth century seems to have been due as much to quarrelling among its so-called leaders as to pressure from outside powers.

The boundaries of the newly constituted state reach to the Baltic Heights on the north and the Carpathians on the south, and coincide fairly well with the distribution of the Polish-speaking people on the north, west, and south. On the west some Germans are included inside the Polish boundary, especially in Upper Silesia, and 148,000 Poles remain in Germany. On the eastern side there is a conflict between the ethnic and the imperial idea, in which the imperial has won, since the eastern lands which have Polish overlords and Russian peasants were ceded to

Poland by Russia. It is stated, however, that there is little nationalist feeling among the White Russian and Ukrainian peasants. There is no natural boundary on either east or west, though the Prypeć marshes of the east form a belt of scanty population and serve as an obstacle to movement.

In Poland the sharp line of demarcation between the northern lowlands and the Hercynian uplands does not exist, as the uplands themselves are of no great height, and in contrast to the forested mountains of the horsts of central Germany they generally consist of low, level plateaus, as treeless as they are highly cultivated. Moreover, these plateaus, generally below a height of 1,000 feet, were sufficiently low to be covered by glacial material, and though in the south-east they were too remote to be reached by the ice-sheet, even during the first glaciation, they are now generally loss-covered, while the region includes wide depressions often covered with thick deposits of glacial clay, sands, and gravels. Such depressions are the Nida syncline and the triangular plain of the Upper Vistula and San between Cracow, Sandomierz, and Jarosław.

The Łysogóry, which raise their quartzite summits to a height of 2,000 feet and are partly forest-covered, as their name implies, are the main exception to the general fertility of the Hercynian uplands, whose plateaus may be well compared to the rich agricultural plains in the scarplands of Swabia. Indeed, even the word "uplands" is misleading, for to all intents and purposes they form a continuation of the great agricultural plains of northern Poland, and are distinctly more fertile, better populated, and easier to traverse than the lands at slightly lower levels farther north.

The two regions together form the greater part of the newly constituted state of Poland, the only mountainous part being the southern borderlands, formed by the northern chains of the Carpathian mountain system, which occupy little more than a tenth of the total area. Poland is, in fact, essentially a land of great plains, the only European country of large size which possesses an equal percentage of plain being Russia.

The concept of Poland as a transitional land between central and eastern Europe is a useful one, since transition is the keynote of so many aspects of the geography of the country. As regards climate there is a rapid increase in

the severity of the winters from west to east in Poland, to such an extent that the icy hand of the true Continental winter is felt in the east, where on an average three to four months have a temperature below freezing. Culturally, there is a progressive falling-off in the degree of economic development, in the density of population, and in the standard of living from west to east, according to whether the land was under German administration, was part of the former Russian province of Poland, or was purely Russian before the formation of the new Polish state in 1919; but in the south, where the loss soils of Galicia occur and the land was under Austrian administration, this deterioration is less marked, and to some extent, at least, the very adverse natural environment of the great Prypeć marshes in the east of Poland must be held accountable for the backward conditions of the province of Polesia. Broadly speaking, however, Poland is transitional between an eastern Europe which is a massive continental area of continuous lowland, and a central Europe which is under semi-oceanic influence and is of very varied relief. It is still true to say, also, that Poland is transitional between an agricultural eastern Europe and an industrialised western Europe, though if the efforts of Russia meet with success, this contrast will be reduced.

THE POLISH PLAINS

The morphological development of the northern lowlands of Poland has already been described, so that attention will here be directed to a regional treatment. As in the northern lowlands of Germany, the main drainage, here by the River Vistula, is from south to north, with *urstromtäler*, here called *pradoliny*, running from east to west. The Netze-Vistula-Narew-Biebrza-Niemen line, now canal linked, may be specially noted, and also the Warta-Bzura-Vistula-Bug line farther south. Compared with the north German lowlands the *urstromtäler* are less numerous and there are greater areas of ground-moraine between them. A new element is introduced in eastern Poland, however, by the drainage of the Prypeć towards the east and ultimately to the Black Sea.

The monotonous plains of northern Poland present much the same series of pictures over hundreds of miles, the same flatness, even the valleys being barely below the general level and the terminal moraines seldom above it, the same wide expanses of cultivation on the ground

moraine, the same coniferous forests, sometimes cleared, on the *sandr* and terminal moraines, the same alternation of sand-dunes and marshes, sometimes reclaimed, in the *pradoliny*. Only a few areas show any departure from this general sameness, and in most cases it is rather a variation in economic development or in type of population than of physical features.

The Polish Corridor.—Only very small sections of the Baltic Heights and coast are included within the frontiers of Poland, a state of affairs which is based on the long historical divorcement of the Poles from the sea. The town of Danzig near the mouth of the Vistula is the chief marine outlet, but although within the Polish customs union, it is not actually in Poland. Originally a Slav settlement, it was colonised by the Teutonic knights in the Middle Ages and flourished as a Hanse city. It was seized by Poland in the fifteenth century, but fell to Prussia in 1793, and the population in 1914 was 90 per cent. German. In 1919 at the end of the Great War it was declared a Free State, together with a small area of land surrounding it, the total area amounting to 754 square miles. It is, of course, the natural sea outlet of the Vistula basin which forms the homeland of the Polish people, but owing to the prolonged Germanisation of the Baltic coastlands its population is indubitably German. A new and wholly Polish port is being built some ten miles away at Gdynia, on Poland's short stretch of coastline. Access to it is *via* the narrow Polish Corridor, only about thirty miles wide. Elsewhere Poland is cut off from the coast by West and East Prussia and by Lithuania. The northern part of the Polish Corridor is formed chiefly by the terminal moraine of the Baltic Heights, which here reach 1,086 feet high, and the southern part by the barren Tucheler Heide, which consists of a sandy outwash plain.

Poznań.—The main difference between Poznań and the neighbouring Polish provinces lies in its greater agricultural productivity. This in turn seems due to the fact that agriculture was better organised in the German Empire than in the Russian, and this province, under the name of Posen, was German from the second partition of Poland in 1793 down to 1919. The same crops are cultivated as elsewhere in the glaciated plains, with rye and potatoes in a leading position, but wheat, beet-sugar, cattle, and pigs achieve considerable importance, and the standard

of farming and the yield of production are high. The use of chemical fertilisers is widespread and a good railway network facilitated the collection and despatch of the agricultural products to the cities of northern Germany which were the chief markets before the War. The population, however, remained overwhelmingly Polish, since large estates with Polish labourers were the rule, and though the cities contained considerable numbers of Germans, these were never in the majority and at the present day few remain.

In spite of the considerable density of population (213 per square mile) there is only one large city, namely, Poznań itself (247,000),¹ on the River Warta. It may be considered to be the regional capital of the area and is also the only manufacturing town of importance in the region. It carries on various industries connected with agriculture, such as the manufacture of agricultural machinery, chemical manures, flour-milling, and brewing.

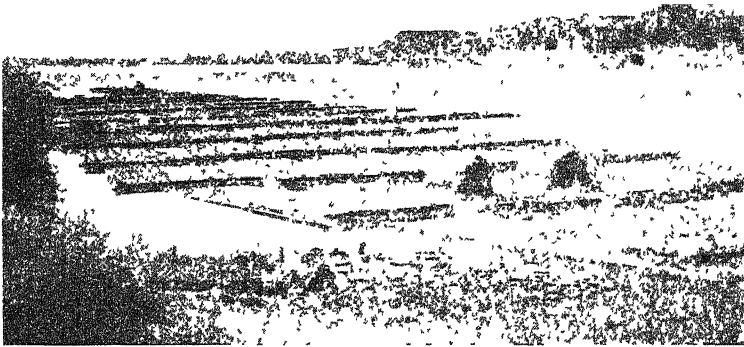
Thirty to forty miles east of the town of Poznań and north of the River Warta is the Polish lakeland, apparently similar in origin to the Havel-Spree lakeland, *i.e.* formed by sub-glacial erosion. The area is interesting as containing black loams of unknown origin, which, it is claimed, formed one of the few non-forested areas of early Poland, that is to say, before the tenth century A.D. Here also the glacial cover is only about 10 to 20 feet thick and salt deposits were accessible below, and these gave the region an early importance. The region is said to be the cradle of Polish nationality and the place of origin of the Piast royal family.

The Region of the Middle Vistula.—Very similar physical conditions are found in the duchy of Warsaw to those in the duchy of Poznań. There is the same high percentage of valley, the same somewhat haphazard alternation of the clays of the ground moraine with the gravels of the terminal moraines. Here also the forest has been largely cleared, only 11 per cent. of the total area remaining forest-covered as against 17 per cent. in Poznań. Probably deforestation has been carried too far, and the resultant cleared land is poor, but the region is dominated by peasant agriculture with a lower standard of cultivation than in Poznań and a greater density of population, so that the economic pressure to clear the soil was greater.

The distinctive physical features of this area are the

¹ Population figures are from the 1931 Census

ancient lake basins of Warsaw and Płock, where water was dammed up in front of the ice-sheet (*See Chapter XVIII.*) These basins have undergone many phases of deposition and erosion, and the resultant bordering terraces provide exceptionally good soil, securely above flood-level but near the waterway. The Vistula itself is often braided and flows through a broad valley, originally marshy and still very liable to floods. Elsewhere in the valleys sand-dunes have been piled up, particularly on the eastern side,



[Courtesy Polish Embassy]

FIG 67 —RAFTS ON THE VISTULA NEAR TORUŃ.

and these provide dry material, it is true, but generally quite useless for cultivation.

The distinctive human feature of this area is the city of Warsaw (Polish, Warszawa), with over a million inhabitants. The city only became the capital of Poland at the end of the sixteenth century, the former capital having been at Cracow in Galicia. The city itself has a good site on a terrace on the left bank of the Vistula, above the level of flood, and at a point where the absence of marshes gave a fairly easy crossing. The central position is also good, and it may perhaps be said that any suitable site near that position would have given rise to an important town. To-day Warsaw is the administrative and

commercial centre of Poland and an important industrial city, manufacturing in particular textiles and machinery.

The town of Bromberg (Polish, Bydgoszcz ; 118,000), though in the duchy of Poznań, may be mentioned here as the only really large town on the Vistula between Warsaw and Danzig. It manufactures a good deal of the timber which is floated down the river, and also forwards much timber westwards along the Bromberg Canal, at whose junction with the Vistula it stands. Germans represent about a quarter of the inhabitants, about the same proportion as at Toruń (40,000), higher up the Vistula.

Łódź and District.—About seventy miles south-west of Warsaw, on the low and insignificant watershed between the Vistula and the Warta-Oder systems, lies the manufacturing centre of Łódź. Its site is seemingly devoid of any geographical advantages and the town itself was a nineteenth-century artificial creation on the part of textile manufacturers, mainly German, who wished to take advantage of a position in former "Congress" or Russian Poland, inside the tariff wall, and so have the advantage of the vast Russian market. It is now the second largest town of Poland, with 605,000 inhabitants, but has suffered from the closing of the Russian market since Poland gained its independence. There is a large ready-made clothing industry, particularly associated with the Jewish population.

The smaller towns of Radom (78,000) and Lublin (113,000), some sixty miles south and ninety miles south-east of Warsaw respectively, also have textile industries.

The Forests of North-Eastern Poland (Wilno and Nowogródek counties).—The north-eastern lands of Poland, including the Wilno salient, are generally poor and have a low density of population (106 per square mile). Even between the Vistula and Narew in the Mława region there is an expanse of accidented end-moraine country, and east of Białystok in the duchies of Wilno, Nowogródek, and Polesie there is a broad region of forests, unproductive heaths, and swamps, especially in Polesie. The ground is considerably accidented in Wilno and Nowogródek, partly owing to the wide occurrence of lobes of end-moraine and partly owing to the ice-sheet having pushed up the earlier ground moraine into irregular hills. The drainage was much disturbed by glaciation and the valleys are usually marshy.

These areas offered great natural resistance to mankind, and the difficulties of movement and the poverty of the scanty population offer great obstacles to the spread of modern ways and ideas.

East of a line from Białystok to Brześć (Brest Litovsk), the population is mainly Russian or Lithuanian speaking, though the land-owners, the educated classes, and most of the townspeople are usually Poles.

Towns are naturally small and few. Białystok (91,000) is another of Poland's isolated textile towns, with less than 50 per cent. of its total population Polish and the remainder



FIG 68 —PLANTING SUGAR-BEET IN CENTRAL POLAND, PROVINCE
OF WARSAW

Jewish. Wilno (197,000), the capital of the region of the same name, is somewhat exceptional. Amid the general tangle of disordered hillocks it grew up at a nodal position where the River Wilja, giving communication to the River Niemen and the Baltic, is crossed by another depression leading towards the Bug and the lands of central Vistula. The Wilno region was claimed by both the new states of Lithuania and Poland after the Great War. It was originally part of the old kingdom of Lithuania, but came much under Polish influence after the union of the two countries. The town of Wilno itself was a centre of Polish culture and had a university founded in 1578, though it was suppressed by Russia in 1832. Several

of the most famous Polish leaders have come from Wilno, including the nineteenth-century patriot Kosciuszko and the present uncrowned ruler of Poland, Marshal Pilsudski. The peasants of the area are mainly non-Polish speaking, but it is said that nationalist feeling among them is little developed in any direction.

The Polesian or Prypeć marshes form the largest area of swampy land in Europe, stretching for about 120 miles from east to west and 90 miles from north to south. They form one of the "poverty corners" of Europe, on account of the natural difficulties of the region. The marshes lie at the headwaters of the Dnieper, though they can hardly be said to be drained by its tributary the Prypeć and its feeders which wander through the swamps. They rest on the site of an ancient glacial lake which received at one time the drainage from the Baltic Heights to the north, but the nature of the barrier that held up the waters on the southern side is uncertain. The area of the lake diminished by the silting-up process, and the growth of peat is slowly completing the work. The scanty and scattered population lives on small patches of dry ground above flood-level. Drainage operations were begun by the Russians before the War, and it seems possible that considerable areas could be drained on the lines of fen colonies. The marshes have always formed a strategic and commercial barrier between central Europe and Russia proper.

THE HERCYNIAN UPLANDS

South of the northern plains there is a band of country, some 100 miles wide from north to south and 350 miles from the western frontier of Poland to the eastern, which has at least a few recognisable lines of relief and where the physiognomy is based on a less haphazard distribution of the subsoil. From east to west there stretches a series of low plateaus and basins, mainly developed on Cretaceous measures which have usually been little disturbed. The resurgence of two old Hercynian blocks, however, has caused a tilting of the overlying strata west of the Vistula and has also caused denudation to expose (a) the Mesozoic rocks whose Jurassic limestones on the west form the Czeszochowa-Cracow scarp and (b) the Palaeozoic rocks in the Łysogóry east of Kielce and in the Silesian coalfield. East of the River San, also, the Cretaceous

measures have been warped to cause the anticline of Rostocze running north-westwards from Lwów (better known as Lemberg), and also the monocline of the Gołogóry running north-eastwards from the same town. West of Lwów there is usually a cover of glacial material, but the regions east of the town, *i. e.* the plateaus of Volhynia and Podolie, lay outside the widest scope of the glaciation, though they both bear a mantle of loess. This belt may conveniently be called the Polish scarplands, though, as in the scarplands of Germany, the wide plains rather than the escarpments form the conspicuous feature over the greater part of the area.

South of these Polish scarplands is a geosyncline, apparently corresponding to that of the Alpine Foreland and similarly filled in with Tertiary sediments and in places by glacial material. This depression is drained towards

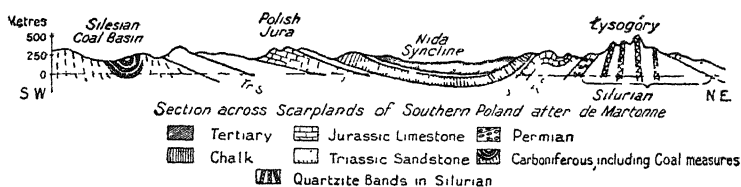


FIG 69—SECTION ACROSS THE SCARPLANDS OF SOUTHERN POLAND

the north by the Vistula and its tributary the San and towards the south-east by the Dniester and its affluents. The land rises gradually to the foot-hills of the Carpathian system, here known as the Beskids.

The Silesian Industrial Region.—The actual productive coal measures either outcrop or come very near the surface in the region of the great industrial conurbation of Gleiwitz-Beuthen-Königshütte-Sosnowiec. The measures sink south-eastwards until they are more than 3,250 feet below sea-level beneath the forests of Pless (Pszczyna in Polish), but rise again on the southern side of the basin and are worked near Teschen (Cieszyn in Polish), and are believed to be workable near Cracow.

The Silesian coalfield stands second only to the Ruhr coalfield on the Continent in respect to its coal reserves.

Before the war of 1914–1918 the coalfield was divided between Germany, Russia, and Austria, and at the present day between Germany, Poland, and the “protectorate” of Moravia-Silesia.

The industrial region, which continues without a break

across the Germano-Polish frontier, forms a sprawling mass of "Black Country" in the heart of thinly peopled forest-land on poor, sandy, glacial soils. Glerwitz, Hindenburg, and Beuthen remained on the German side in 1919, Königshutte (Pol., Królewska Huta), Kattowitz (Pol., Katowice), and Tarnowitz (Pol., Tarnowskie Góry) went to Poland. In 1938-39 both Germany and Poland increased their territory at the expense of Czecho-Slovakia. The industrial development of the region was based on the presence of iron ore, originally smelted by charcoal, and the intensive development of the coalfield came rather late in the nineteenth century, after the unification of Germany. The iron ore is now considered uneconomic to work, but the considerable supplies of lead and still more of zinc are important, Poland now being one of the few countries of Europe to possess considerable quantities of the latter mineral. The production of coal from the Polish section of the field usually exceeds 40 million tons a year, and is greater than the home market can consume, since Poland is but little industrialised. As the German market had been closed against this coal, an outlet has been sought in Scandinavia and in the agricultural countries to the south which are poor in coal, such as Austria, Hungary, the Balkan countries, and Italy. To some extent the Polish coal has ousted British coal from the Baltic, since it is produced with much cheaper labour.

The main branch of manufacture is of iron and steel goods, but on the whole the higher branches of metallurgy are not represented, the industry thus showing a lack of evolution common to the youth of most industries. Iron ore and pig-iron are imported from Sweden and England. The zinc and chemical industries make up the other branches of industry, the latter partly derived from by-products of the zinc-smelting and the coke ovens, fertilisers naturally taking a high place in the output.

The Silesian corridor is also important in regard to communications, as it gives an easy routeway to the Danubian basin.

The Polish Jura.—Overlooking the Silesian lowlands is an escarpment formed of Jurassic limestone which extends in a north-west to south-east direction from Częstochowa on the Warta to Cracow on the upper Vistula. It appears to have no recognised geographical name, though the plateau on top is sometimes known as the plateau of Wolbrom after a small town of the same name.

but the term Polish Jura may serve to indicate its character, though its similarity is to the unfolded German Jura rather than to the Franco-Swiss Jura. It formed a well-marked frontier feature for several hundred years, actually between the fourteenth century, when Silesia ceased to be Polish, and the eighteenth century, when Poland ceased to exist as a state. Numerous ruins of old castles and fortresses bear witness to the former military importance of the scarp. The top of the plateau to the east of the scarp is bleak, lacking in surface water, and has a scanty population. Currents of life are concentrated at either end, at the important cotton-manufacturing town of Częstochowa (118,000) and the old capital of Poland, Cracow (*see* p. 282).

The Nida Depression.—This depression, drained southwards by the Nida tributary of the Vistula, occupies the middle of the synclinal between the two old Hercynian blocks of the Silesian coal basin and the Łysogóry. Its Cretaceous measures are covered by Tertiary sediments, and these again by glacial material, and as the latter are mainly sterile sands and gravels, or heavy clays which easily become boggy, the landscape in parts recalls the northern lowlands, with forest, heath, and bog. Where the glacial soils have been denuded, however, the Tertiaries, which are mainly limestones, provide a good soil known as the *rendzina*, which is particularly rich in humus. The southern part of this region, together with the strip of country on the north of the Vistula from Cracow to Sandomierz, is loss-covered. Hence wheat appears in the rural economy as a change from the rye and potatoes of the glaciated northern plains.

The Łysogóry.—The parallel crests of the Łysogóry follow the prevailing strike of the country from north-west to south-east. This old horst is a region of forests and ancient mines reminiscent of the Harz massif of Germany. Though generally rounded, the crests are sometimes sharp and craggy.

The Depression of the San and Upper Vistula.—The triangular depression between Cracow, Sandomierz, and Przemyśl becomes increasingly fertile towards the south as the coarse glacier-soils give way to the loss. It also becomes lightly dissected into hills by the San and Vistula and their affluents, but without providing any obstacle to movement, and an important railway line runs from east to west at the base of the triangle along the foot of the Beskids. Along this line a number of small market towns

lie at the entrances to the mountain valleys, the town of Przemyśl being the largest.

The city of Cracow (Polish, Kraków ; 221,000) lies at an important position in the gap between the Beskids and the Jurassic scarp already mentioned. Its ancient importance was largely strategic, and it was chosen as capital by the kings of Poland in the thirteenth century and kept that rank for three hundred years. Its present importance is mainly commercial, and it shows signs of playing a similar rôle in relation to the Silesian coalfield as the similar ancient city of Cologne plays in regard to the Ruhr coalfield.

The Uplands East of the Vistula.—The plateau of Lublin and the hill-country of Volhynia are transitional from the northern plain to the loss uplands. Both have a subsoil of chalk with a considerable covering of loss. Wide treeless horizons are here the rule, and wheat, the typical cereal of the loss lands of Europe, takes the place of rye as the chief cereal. Here houses are to be seen cut in the loss, as in parts of China. Volhynia is inhabited mainly by Ruthenian-speaking people, with the small towns showing 50 per cent or more of Jews, an element of the town population already noted as being usual in Poland, but particularly prominent among the unsophisticated peasant population of eastern Poland. The Jews are principally employed in shopkeeping and petty commerce.

The most extreme of these plateaus in its steppe-like appearance is the plateau of Podolie, also developed on loss-covered limestone, in this case Tertiary overlying Cretaceous. Treeless, hedgeless, for large stretches waterless—it shows in winter no sign of life, but in summer it is a vast field, growing wheat, barley, oats, and other cereals, sugar-beet, and subsistence crops. In certain areas, however, karstic phenomena render cultivation difficult. The only town of any size is Tarnopol.

In the south the plateau is dissected by a number of abrupt, cañon-like valleys, which form an obstacle to east-west movement and which cut down to the Palæozoic floor. There are two notable features of the border of this plateau. In the north-west it rises to the Gologóry, whose outward-facing scarp drops down to the Volhynian hill-country, and in the east it rises to the ridge of the Miodobory, known locally by its Ruthenian inhabitants as Toltry, whose elevation is due to the resistant power of limestones of Sarmatian age.

The Dniester Corridor.—The rivers flowing southwards from the Podolian plateau join the south-eastward flowing

Dniester. The Dniester corridor is a continuation of the San-Vistula depression, with Tertiary material covered mainly by loess. Owing, however, to a presumed uplift of a floor of very ancient rocks, the latter come near enough to the surface to have been reached by the incised meanders of the Dniester. This floor is no other than the Archæan floor of the " Russian " Platform, so that structurally, as in many other ways, this region belongs to eastern Europe

[For the Polish Carpathian zone *see* Chapter XXVIII]



[Courtesy Polish Embassy]

FIG 70—KASPEROWCE, A VILLAGE NEAR ZALESZCZYKI, IN A VALLEY
TYPICAL OF PODOLIE

Note the incised valley and level, treeless plateau

Economic Summary.—Poland is still essentially an agricultural country, some three-quarters of the population being engaged in agriculture, and only one-tenth in industry. Forty-eight per cent. of the total area is arable, a percentage exceeded only in Denmark and Hungary. The leading and most widely cultivated crops are rye, potatoes, and hay ; sugar-beet is also important, especially in Poznań and the Polish Corridor. Forests cover one-fifth of the total area of the country, but though Poland is one of the richest countries of Europe in this respect, the figure given includes a fair amount of poorly-timbered land, and the value of the forests should not be exaggerated.

Mining is confined mainly to the southern part of the country, the chief minerals being coal, zinc, oil, and salt. The output from the Polish section of the Upper Silesian

coalfield was 38,000,000 tons in 1931 and 36 million tons in 1937. The output of zinc from the same area and from the Łysogóry amounted to 131,000 tons in 1931 and 107,000 tons in 1937. The oil-wells of the Galician foothills appear to be approaching exhaustion, and only 502,000 tons of petroleum were produced in 1937. This amounted to only $\frac{1}{4}$ of one per cent. of the world's total output, whereas in 1919 Poland supplied five per cent. of the total. Of the other minerals, salt is the most important, and is mined in the Carpathian Foreland, and also in the north of Poland, to the south of Toruń.

Industrial development is concerned primarily with textiles and metallurgy. Poland, however, holds only ninth place in Europe in respect to cotton spindles installed, though this is her leading textile. The metallurgical industry is handicapped by the shortage of iron ore, only 776,000 tons being mined in 1937, and the output of pig-iron is small. As regards steel manufacture, however, with the aid of imported pig-iron, Poland stands in the same category as such countries as Italy and Sweden, the output being nearly one and a half million tons in 1937. Other considerable branches of industry are connected with the timber, sugar-beet, and oil resources, while the chemical industry is of growing importance.

As regards exports, raw materials and semi-manufactured goods account for half the total value, with coal and timber competing for first place, and animal products (meat and eggs) and cereals following. Textiles are the most important of the manufactured goods exported. The imports are mainly manufactured goods with the exception of raw materials for the textile industry and "colonial" produce.

REFERENCES

The Polish Handbook (London, 1925) gives a certain amount of useful geographical and economic material. *Polish Countrysides*, by Louise A. Boyd (New York, 1937,) contains some five hundred photographs covering every aspect of country life. See also, *Poland*, by R. H. Kirić (Birmingham, 1936), and "La Pologne," by P. Camena d'Almeida (*Ann de Géogr*, Vol. 32, 1923) *Handbuch von Polen*, by E. Wunderlich, (2nd ed., Berlin, 1918), deals at length with the physical geography of "Congress" Poland. "Le Partage de la Haute Silésie," by P. Dumas (*Ann de Géogr*, Vol. 31, 1922), contains excellent diagrams.

Topographic maps were issued by Germany, Russia, and Austria for those parts of Poland formerly under their respective administrations. A new series on a scale of 1 : 100,000 is in process of publication.

CHAPTER XXIII

THE CZECH LANDS

ALTHOUGH Czechoslovakia was not very large, its total area of 54,000 square miles being little more than that of England without Wales, yet its key position in Central Europe, its natural wealth and the energy of its inhabitants made it one of the most noteworthy of the new countries of Europe.

The Republic was formed in 1918, when a National Council of Czechs and Slovaks took over the government of certain lands which had been formerly included in the Austro-Hungarian Empire. These lands comprised, first, the old historic Czech Kingdom of Bohemia, Moravia; secondly, the small adjacent region of Austrian Silesia which had been administered from Vienna for several hundred years; and thirdly, the relatively backward lands of Slovakia and Ruthenia which had formed part of the Hungarian Empire since its inception. The bond of Union between Czechs and Slovaks was primarily their common Slavonic language, there being less difference between Czech and Slovak than there is between "standard" English and the English of Robert Burns.¹ A second powerful bond was their passionate desire for release from the oppression which had characterised Austrian and Hungarian rule. This oppression fell more heavily on the Czechs than on the Slovaks, for the Bohemian Kingdom, including Moravia, had already had a long and distinguished history before it misguidedly chose an Austrian Hapsburg as its king. Its "Golden Age" was as early as the fourteenth century, when the Bohemian king, Charles IV (a Lorrainer) became Holy Roman Emperor, and Bohemia ranked among the most cultured states of Europe. The earliest University of the Empire was that of Prague, founded by Charles IV in 1348.

The election of a Hapsburg to the throne of Bohemia in the 16th century marked the beginning of the policy of Germanisation, which gained in intensity when the Protestant reformer Jan Hus became identified with the

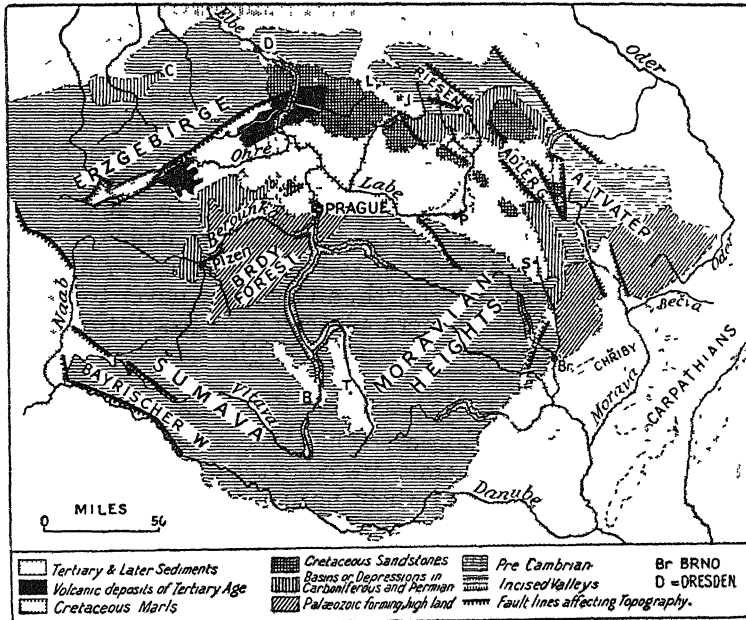
¹ Of the three main "founders" of Czechoslovakia, Masaryk was born in Moravia, Beneš in Bohemia, and Štefánik in Slovakia.

cause of Czech nationalism. After the disastrous defeat of the Czechs at the Battle of White Mountain, just outside Prague, in 1620, the Czech leaders were executed and their estates confiscated. From that time onwards every effort was made to prevent the Czechs from acquiring either wealth or influence. The use of the Czech language was forbidden for all official purposes, no university education could be obtained in Czech, Czechs were not allowed to occupy any responsible administrative positions, in many cases, not even subordinate positions.

For 200 years it seemed that Bohemian nationalism would never raise its head again, but signs of life were discernible in the nineteenth century with the revival of interest in the Czech language and literature. The Czechs also made strenuous efforts to raise themselves from the status of illiterate peasants and so justify their claim to self-government. The rise of industrialism and the introduction of modern methods of farming brought an increase of wealth and power to the Czechs, but the justice of their claim to independence was not acknowledged until October 1918 when the Emperor Charles offered them federal freedom, an offer which unfortunately came too late.

Bohemia.—Bohemia, the western section of Czechoslovakia, is a rather complex piece of Hercynian Europe. It is true that the whole area may be looked upon as a rectangular-shaped horst, with corners pointing north, east, south, and west, but it is a horst containing many minor horsts and basins and it is largely covered in the northerly parts with Secondary and Tertiary deposits. The region consists essentially of the peneplaned stumps of a folded mountain system of Carboniferous age, with traces of earlier folding. The whole region was mainly submerged during Cretaceous times, though from the marly and sandy character of these deposits it is evident that they must have been deposited in a shallow sea near land. The present horst was raised up bodily as a consequence of the earth movements connected with the building of the Alps and Carpathians, but was considerably warped as well as faulted in the process. The main upwarpings took place in two regions, namely, along the south-eastern border, forming the broad swelling of the Moravian Heights, which reach only 2,739 feet, and along the south-western border in the Bohemian Forest (Cz., Šumava), which reaches nearly 5,000 feet. The main

faulting took place along three lines of weakness, namely, along the outer or western side of the Šumava, along the southern or inner side of the Erzgebirge (Cz., Krušné Hory), which border Bohemia on the north-west, and on the north-east side in the Riesengebirge (Cz., Krkonoše) and Sudetes, where a complicated system of blocks and depressions arose (see p 264). Volcanic outpourings of Tertiary age, sometimes accompanied the dislocations, especially in the north-west. It resulted from these warpings and faultings



[After Machatschek and de Martonne.

FIG 71—MORPHOLOGICAL DIAGRAM OF BOHEMIA AND MORAVIA

that the middle of the horst became a basin, in whose lower northerly part the Cretaceous and Tertiary cover was preserved. The Tertiary sediments still remain at the foot of the Erzgebirge in the Karlsbad-Teplitz depression, which is partially filled in by Tertiary volcanic deposits and thereby divided into a number of basins, and the Secondary deposits remain in the plain of the Elbe (Cz., Labe). The rest of the Bohemian basin consists mainly of a featureless plateau of crystalline rocks, mainly granites and ancient crystalline schists, but, quite

exceptionally, the Brdy Forest south of the River Berounka (Ger., Beraun) shows little changed Pre-Cambrian and Palæozoic rocks outcropping from north-east to south-west, with the hard quartzites standing up as ridges. The basin of Plzeň (Ger., Pilsen), on the Berounka, and the Kladno basin are excavated in Carboniferous rock. The two depressions of Budějovice (Ger., Budweiss) and Třeboň (Ger., Wittingau) in the south of the crystalline plateau are filled by Tertiary deposits.

The river system reveals the general slope of the land, the main river, the Vltava (Ger., Moldau), forming a diagonal from the southern to the northern corner, where it cuts through the surrounding mountains (*see* p. 264).

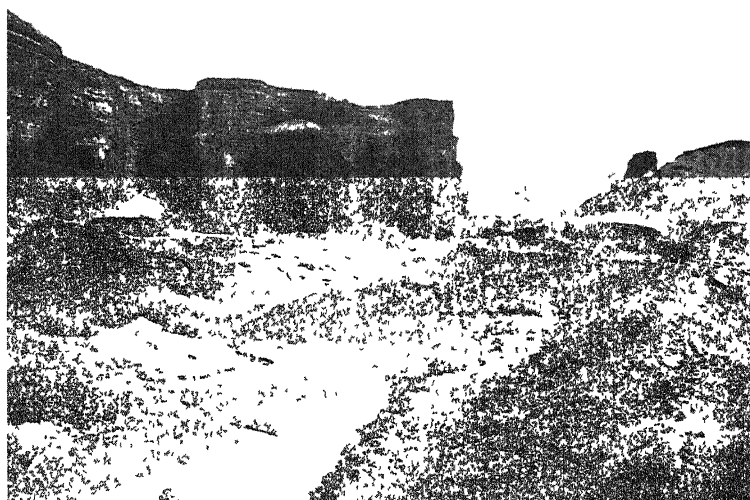
Climatically the bordering mountains are areas of heavy rainfall and raw climate, but the northern plain, by its position and relatively low relief (*c.* 700 feet), has little rain and high summer temperatures, though with somewhat severe winters, *e.g.* Prague: January, 29·7° F.; July, 66·2° F.; mean annual rainfall, 19 inches. The Labe plains have almost a steppe climate, with loss soil and patches of Black Earth, and appear never to have been forested. The southern plateau also has little rain, but summer temperatures are not so high.

NATURAL REGIONS OF BOHEMIA

A. The Mountain Border.—On three sides the mountainous frontiers of Bohemia are co-extensive with part of the German frontier and their nature has already been described in Chapter XX. Each of these sides is about 200 miles long, and the greatest heights are found in the Šumava in the south-east and the Krkonoše (Ger., Riesengebirge) in the north-east, the former reaching a height of over 4,000 feet and the latter over 5,000 feet, though the crests have the usual rounded forms common to the mountains of the Hercynian system. The Šumava on the south-west is the most densely forested and most scantily peopled of all the bordering mountains, forestry being the principal occupation. The Erzgebirge have been largely cleared and are under cultivation for hardy crops, and home industries, *e.g.* gloves, chair-making, are carried on to a considerable extent. Joachimstal (Cz., Jáchymov) is noted for its radium mines. Throughout the mountainous border the people are almost entirely German-speaking and are descended from settlers who penetrated the Slavonic-speaking salient of Bohemia in

the Middle Ages. In places they also penetrated into the basins at the foot of the mountains.

B. The Northern Plains and Basins.—(1) *The Tertiary Depressions of Karlsbad and Teplitz*—These lie at the faulted foot of the Erzgebirge and consist of a number of basins separated by massifs of considerable height. The basins are particularly notable in having preserved large quantities of Tertiary lignite. In the west is the little basin of Eger (Cz., Cheb), which, however, has no workable lignites and lies at a height of some 1,300 feet and is



[Courtesy Czechoslovak Legation]

FIG 72 —LIGNITE WORKINGS NEAR MOSI (BRUX) IN NORTHERN BOHEMIA,

The lignite occurs near the surface and the mines are open to the sky

mainly devoted to pasture. East of this is the basin of Falkenau-Karlsbad (Cz., Falknov-Karlovy Vary), both towns lying on the Eger River (Cz., Ohře). This basin possesses considerable and varied resources, namely, lignite, mineral springs, which have made the fortunes of Karlsbad and Marienbad (Cz., Mariánské Lázně), and kaolin from the neighbouring granitic Kaiserwald for the Karlsbad porcelain industry. East of this basin is the volcanic massif of Doupov, reaching a height of 3,000 feet, but on the far side lies the loss-covered Teplitz basin (Cz., Teplice), which is some forty miles long and of great agricultural richness, as well as containing the largest

deposits of lignite in the country, some 15 million tons being mined annually. A flourishing glass industry is found here, and machinery of various kinds is also manufactured. The volcanic plateau of the Bohemian Mittelgebirge (Cz., Středohoří) succeeds this basin eastwards, but its fertile basalts render it suitable to cultivation up to a height of nearly 2,000 feet, and its lower slopes carry orchards, hops, and wheat. The River Labe crosses the plateau in a well-incised valley. Aussig (Cz., Ústí), with suburbs *c.* 70,000, is a river port and manufactures chemicals.

The Tertiary depression was colonised by Germans from the Erzgebirge in the Middle Ages, but increasing numbers of Czechs have settled there, especially in the Teplitz basin, since the development of the mines called for an increase of labour.

(ii) *Basins and Plateaus at the foot of the Riesengebirge.*—At the foot of the Riesengebirge lies a depression separated from the Labe plain by plateaus of hard Cretaceous sandstone. Here a considerable textile industry, mainly cotton, has developed from an old domestic linen industry using locally grown flax. Reichenberg (Cz., Liberec), which with its suburbs numbers about 72,000 people, is the centre of the scattered industry. Gablonz (Cz., Jablonec; 34,000)¹ is the centre of the most original aspect of the Bohemian glass industry and manufactures beads and imitation jewellery of all kinds. The population of this region is also mainly German-speaking.

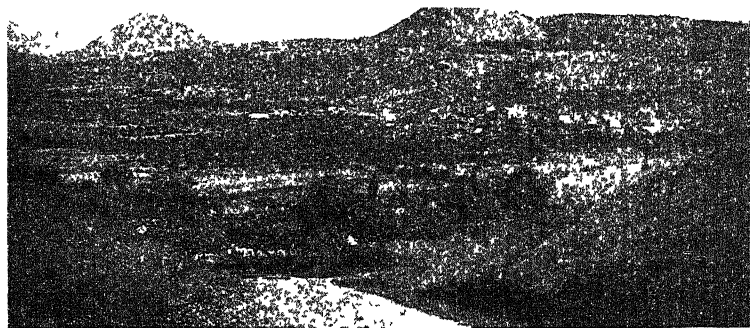
(iii) *The Labe Plain.*—This is the only large plain of Bohemia and stretches from south-east to north-west for a distance of sixty miles, beginning near Zwittau (Cz., Svitavy) to beyond the junction of the Labe and Vltava. It is some twenty miles broad, lies mainly below 700 feet in height, and is of exceptional fertility, its Cretaceous marls being mainly loss-covered. Farming is on modern lines, including such commodities as beet-sugar and forage crops, as well as wheat and other cereals, while stall-fed cattle and pigs are also important. The population is Czech-speaking and is fairly dense, but there are few towns of any size, the nearness of Prague discouraging the growth of other urban centres.

The Cretaceous cover extends to the neighbourhood of Prague, and undoubtedly at one time extended farther south.

¹ Population figures are from the 1930 Census

C. The Bohemian Plateau.—Unlike the northern lowlands of Bohemia, which are a region of rich and varied agriculture as well as considerable industrial development, the uplands of southern Bohemia are regions of poor agriculture, only redeemed by the presence of a few richer basins and by the coal basins of Plzen and Kladno.

(1) *The Basins of Plzeň and Kladno.*—The former was excavated by the Berounka and its numerous tributaries in the rather soft Carboniferous sandstones and shales, and forms a little region of rich agriculture, whose barley



[Courtesy Czechoslovak Legation.]

FIG 73—ORCHARDS AND PLOUGH-LANDS IN THE NORTHERN LOWLANDS OF BOHEMIA

The view is taken south of the Středo Hoří between Třebeň and Libochovice. The two isolated hills are of volcanic origin.

and hops were the original basis of the brewery industry, which attains vast proportions. Plzen (114,000) also possesses large metallurgical works in addition to its breweries, and was the great Austrian manufacturing centre of armaments, the iron ore originally coming from the Brdy Forest to the south. The Plzeň coalfield, however, is now nearly exhausted, but the Kladno field, some twenty miles west of Prague, has an output of about 2 million tons per annum.

(ii) *The Brdy Forest* still retains considerable forest cover (50 per cent.).

(iii) *The Crystalline Plateaus* are regions of undulating relief, varying in height from 700 to 2,700 feet. The rejuvenation of the drainage has caused the larger rivers to incise their beds, but the upper courses and smaller streams still show senile features and are often marshy (*cf.* Plateau de Haut Limousin in the Massif Central of France) The plateau is generally a region of rather poor soils, and potatoes and rye are the dominating crops.

(iv) *The Tertiary Basins of Budějovice and Třeboň*—The latter, at a height of more than 1,400 feet, is little below the level of the surrounding plateau, while the former, at a little over 1,100 feet, is considerably below. The Tertiary clays, though apt to be marshy and still covered with many lakes, are generally fertile. Budějovice (44,000) has a well-known industry in the making of lead pencils, the graphite being obtained from Krumlov south of the basin. In this southern corner of the Bohemian horst the central plateau is not bounded by any definite heights, and communication is not difficult with the Danube valley.

Prague (Cz, Praha; 848,000)—The capital city is situated on the Vltava on the southern border of the northern lowlands, almost in the middle of the Bohemian "diamond." Its name is said to mean "threshold" from the banks of quartzite which outcrop in the river bed having produced fordable shallows, though at the same time they set a limit to navigation. The city is placed at an admirable nodal point and it was of considerable fame in the Middle Ages, but remained small until the middle of the nineteenth century, when industrialisation began to make itself felt in the country. The city itself has important manufactures, using the pig-iron made on the Kladno coalfield for all kinds of metallurgy, including locomotives, machinery of all kinds, agricultural implements, etc. The alimentary industries are well represented, and the products of the neighbouring Labe plain are manufactured as well as imported raw materials. The textile, glove, and glass industries are also of considerable dimensions. The choice of Prague as capital for Czechoslovakia added to the importance and population of the city, which is the commercial and intellectual centre of the country. In addition to the university in which lectures were given in German, the "Charles" university was set up, or rather, revived, in which Czech is the recognised language.

Moravia and Silesia.—Moravia, which comprises the greater part of the basin of the Morava, stretches from the

Moravian Heights of the Bohemian horst on the west to the Carpathian zone on the east, and includes the lowlands of Tertiary and later sediments between the two. The former province of Austrian Silesia, with its coalfield, was also handed over to Czechoslovakia, with the exception of a small piece in the north-east near Teschen (Cz., Těšín), which went to Poland.

The Moravian lowlands are rich lands from an agricultural point of view, but are perhaps better known to the world at large on account of their importance in affording



Photo Centropress, Praha]

[Courtesy Czechoslovak Legation

FIG 74 —THE RIVER VLTAVA IN THE SOUTHERN ENVIRONS OF PRAGUE

Note the incised meanders

one of the main highways of movement in Europe. By linking the lowlands of Silesia with those of the Vienna basin they afford the easiest line of movement between the great Germano-Polish plains and the great plains of the middle Danube, and so form part of the route which links the Baltic to the Mediterranean. The actual "Moravian Gate" lies at the north-eastern end of the lowlands, and it is a narrow depression, only a few miles wide, closely approached by the Carpathians on the east and by the Sudetes on the west. It forms a low water-parting, just over 1,000 feet in height, between the headwaters of the Oder and those of the Bečva, a tributary of

the Morava, or, in other words, between the Baltic and Black Sea drainage areas.

The north-western border of Moravia is formed by the Moravian Heights, which sink down gradually towards the south-east. As already mentioned, these are part of the Bohemian horst, and their gently rounded forms indicate an upraised peneplane. In the western part, centred on Jihlava (Ger., Iglau), the granitic uplands attain considerable heights (between 2,000 and 3,000 feet), and the region is mainly one of poor agriculture and rather scanty population. Farther east there is a north to south depression, presumably a down-warping of the crystalline horst, which has been partially filled by sedimentary deposits, largely of Cretaceous age. In these fairly easily eroded marls and sandstones the rivers have cut deep valleys, and in particular the Svitava offers a line of movement below 1,500 feet which is followed by the railway between Prague and Brno, though the main line between Prague and Vienna goes over the granitic heights farther west *via* Jihlava. East of the Svitava depression the horst rises again, but is practically cut off from the Sudetes by the north-western extension of the Moravian lowlands along the upper Morava.

The Moravian lowlands themselves are divided into three main sections by "islands" of higher and less fertile land, namely, the Ždanský les (Ger., Steinitzer Wald) and the Chřibý (Ger., Mars Gebirge) and the Pavlovské Hills. These uplands run in a north-east to south-west direction and are outlying portions of the Carpathian system, partially submerged by later sediments. To the east of them, below Hradište on the Morava, the lowland is less fertile than usual, and the Morava itself is bordered by marshes, which account to some extent for the old frontier with Hungary following the line of the river. To the north-west lies the fertile country of the upper Morava, surrounding Olomouc (66,000) and Přerov (22,000), and to the west lie the fertile lowlands in front (*i e* east) of Brno (Ger., Brunn).

Agriculture is the dominating interest of these lowlands and crops are rich and varied. Sugar-beet, barley, vines, wheat, rye, and forage crops, cattle and pig-rearing are all important. Manufacturing industries are to a considerable extent concentrated at Brno (264,000), the only really large city of Moravia. Textile industries predominate, though the sheep which formerly supplied the

raw material have now disappeared from the granitic Moravian Heights in favour of cattle. The city is situated at the meeting-place of the route from Prague across the Moravian Heights with the route north-eastwards along the plain to Silesia.

The proximity of the Silesian coal basin is encouraging the growth of factories in Moravia (*e.g.* the Bat'a shoe factory at Zlín, 40 miles east of Brno), but the heavy industries (coke, metallurgy) naturally remain on the coalfield itself, which produces more than three-quarters of the total coal output of the country. The two Ostravas (Moravian and Silesian), Vítkovice and Mariánské Hory together form an industrial conurbation numbering more than 200,000 people.

Czechoslovakia was broken up to satisfy not so much nationalist as military ambitions. Bohemia projected as a salient into the German lands, and no doubt was potentially dangerous to the fulfilment of Germany's revived ambition to dominate Central Europe. The minorities question was used mainly as an excuse, for it is clear that the 3 million German minority received much better treatment than the 10 million Czechs had formerly obtained under German rule. Unfortunately, the world slump fell more heavily on the German, *i.e.* the manufacturing districts than on the purely Czech areas, and thus favourable ground existed for anti-Czech propaganda. Even if, however, most of the Germans of Bohemia—Moravia wished to join the Reich, which is by no means certain, yet this provided no excuse for the seizure of the whole country under the guise of a "protectorate." It is obvious that the Germans are still not willing to accord to the Czechs the same rights which they demand for themselves. "The liberty you claim is liberty to oppress us," wrote Havlíček in 1848.

Unfortunately, Czechoslovakia's strategic position was very weak owing to the country's long, straggling shape, and the position was much worsened by the *Anschluss*, for Bohemia, the most vital part, became almost surrounded by her most powerful and aggressive neighbour.

REFERENCES

J. Moscheles' "Natural Regions of Czechoslovakia" (*Geogr. Rev.*, Vol. 14, 1924) *Landeskunde der Sudeten und West-Karpatenländer*, by F. Machatschek (Stuttgart, 1927) *The Yearbook of the Czechoslovak Republic* (Prague). The superb *Atlas de la République tchécoslovaque* (Prague, 1937), with text, offers a firm practical foundation for the study of the Czechoslovak lands.

CHAPTER XXIII

THE ALPINE REGION

GENERAL INTRODUCTION

THE Alpine arc is some 520 miles long and varies in width from 80 to 140 miles. It contains hundreds of peaks above 10,000 feet high and, in spite of the comparatively low latitude (from about 43° to 48° N.), it carries the greatest glaciers of the mainland of Europe. The greatest average height and the greatest number of high peaks are to be found in the central portion where the range is narrowest, particularly in Switzerland and the adjacent French Savoy, where Mt. Blanc is 15,681 feet in height, while many peaks in the Zermatt and Bernese chains in Switzerland are between 13,000 and 15,000 feet, *eg* the Weisshorn, Dom, and Matterhorn in the former, and the Finsteraarhorn, Jungfrau, and Monch in the latter.

Structure.—It is now generally accepted that the Alps are for the most part built up of a number of nappes piled one on top of the other. (*See* Chapter I.) It is considered from the *facies* of the rocks, *i.e.* their lithological character and fossils when present, that the material forming the nappes was derived from sediments deposited in a great geosyncline occupied by an ancient sea. The upper sediments deposited during Mesozoic times seem to have undergone little metamorphism and now form mainly limestones—believed to have originated in both the northern and southern parts of the sea—or else slates and shales (Fr.; *schistes lustrés*; Ger., *Bündnerschiefer*), believed to have originated in the central part of the sea. The older and more deep-seated rocks of Palæozoic age underwent pronounced metamorphism, presumably owing to the pressure of the great weight of sediments above them, and became very crystalline, but together with much intrusive granite they all became involved in the vast system of earth waves raised by the violence of the earth storm of mid-Tertiary times. Consequently each nappe consists, or consisted originally before denudation set to work, of an inner core of metamorphic crystalline rock

and an outer hull or envelope of little changed sedimentary rocks, though the actual *facies* varies very much from place to place according to the particular position occupied

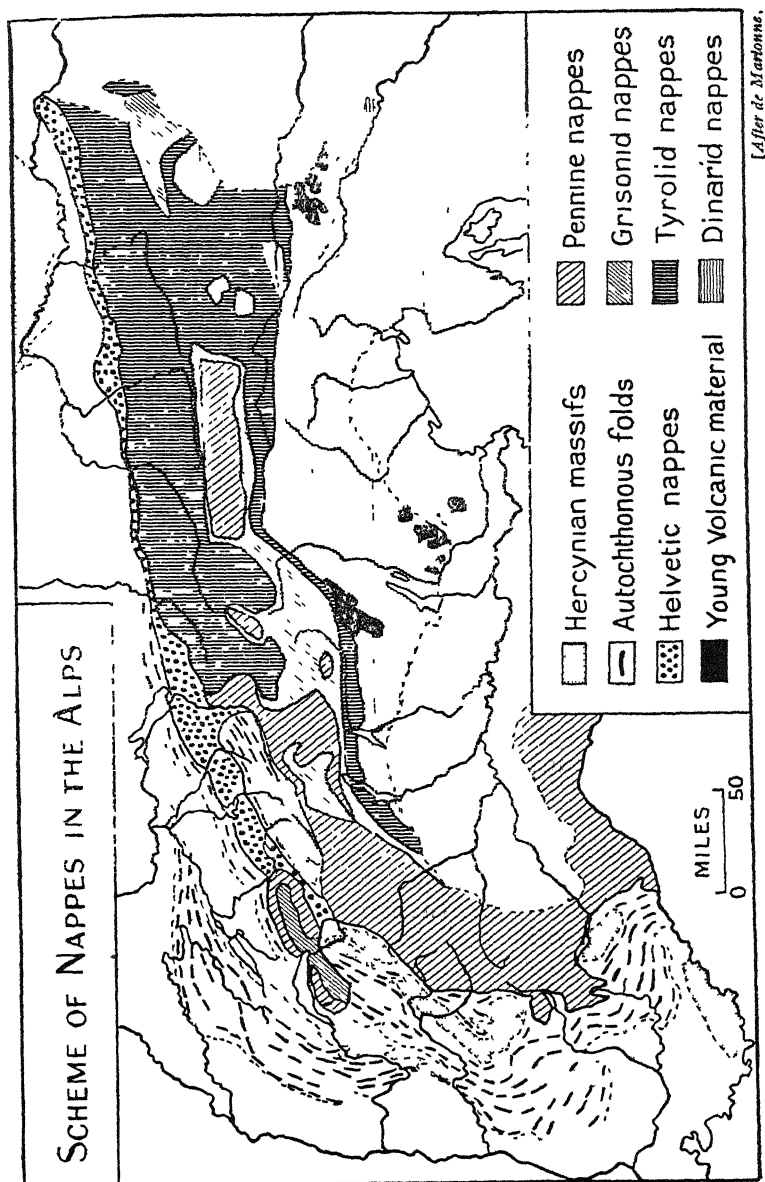


FIG 75 — SYSTEM OF NAPPEs IN THE ALPS.

originally in the geosyncline. Some geologists consider that certain bulges or geanticlines took place in the geosyncline before the end of Palæozoic times, that islands were formed from whose surface rock material was denuded and deposited in the surrounding sea, and that some of the differences in *facies* can be thus explained.

The main nappes recognised are four in number, the Helvetic being the lowest in position, followed by the Pennine, Grisonid, and Tirolid, the two latter together often being called the Austrides. A fourth division, the Dinarid, though it has overridden the Tirolides in places, in general represents an earth wave that toppled backwards, as it were, and its strata are recumbent towards the south. A vast amount of denudation has taken place in the lofty Alpine chain and in places entire nappes have been removed, so that it is only conjectured that the Tirolid nappe was once present in the western Alps, west of the Vorder Rhein, where, indeed, denudation has advanced so far that old Hercynian massifs have been partially exposed to the light of day. Such are from south to north the Mercantour, Pelvoux, Mt. Blanc, and Aar massifs, which are composed principally of hard crystalline rock such as granite and gneiss. It is considered that in parts of the western Alps erosion has removed deposits nine miles thick, though this does not imply that the Alps were once nine miles higher. In the eastern Alps, on the contrary, denudation has proceeded less far, apparently because there the nappes were piled less high, and this in turn may have been due to the underlying Hercynian floor being generally lower than in the west. It must be remembered, however, that the Hercynian massifs themselves were raised bodily by the earth storm.

In consequence of their less exposure to denudation, owing to their lower height, the eastern Alps generally retain the Tirolid nappe, though erosion has laid bare the underlying Grisonid and Pennine nappes in the Hohe Tauern and Upper Engadine region. The exposure of these inliers may be due to the presence, relatively near the surface, of ancient Hercynian massifs, which have arched up the nappes, but this is only conjectural. The southern part of the eastern Alps belongs to the Dinarides, which are not represented in the western Alps, but probably are sunk beneath the alluvial deposits of the North Italian plain. From the geological point of view there is thus a

fundamental distinction between the eastern and western Alps, the dividing line roughly joining Lake Zurich and Lake Como.

It must not be supposed, however, that the nappes are merely simple slabs of the earth's surface. In their movements in regard to each other they themselves developed every kind of overfold and sheared recumbent fold, so that having been acted upon by erosion one outcrop succeeds another in bewildering complexity. Only by the most detailed studies of the lithological and palæontological nature of the outcrops could an elucidation of the structure be reached, and the converse is true, so that it is not possible to deduce anything in detail about the relief or character of the outcrop from broad generalisations about the structure.

Indeed, one of the facts that emerges from a study of the structure of the Alps is the small amount of relation it bears to relief. Only in the autochthonous outer folds of the French Alps is it possible to trace the relations between the folds and the present mountains and valleys. The arcuate shape of the Alps and the parallelism of the chains and longitudinal depressions are features common to most of the young folded mountain areas of the world, and the longitudinal valleys of the Alps do, to some extent, correspond to lines of contact between the different nappes (as in the case of the Rhône valley above Martigny, the Inn valley below Innsbruck, and parts of the Salzach and Enns valleys), or to root zones, but the depressions show a disconcerting habit of passing from one zone to another. No one can say, however, why the transverse valleys, even the most important ones, such as the Adige and Reuss, are situated where they are. The relief, however, is related to the lithological character of the outcrop to some extent, and also to the later geological history of the region in late Tertiary and in Quaternary times.

Quaternary Rejuvenation and Glaciation.—After the great paroxysm of folding which culminated in Miocene times, denudation reduced even the mighty Alps to a low range with mature rounded forms; in certain parts, indeed, peneplane features were copiously produced, particularly in the eastern Alps. The sea invaded the Vienna basin and the basins of Klagenfurt and Laibach in the east of the chain, and the Durance basin in the west. The Alps were saved as a mountain system only

by a great new movement of re-elevation, but this time a vertical (epeirogenic) movement *en masse*, which was inaugurated at the close of Tertiary times and was largely responsible for the present great height.

This movement had already led to the rejuvenation of the river system and an increased rate of erosion before the onset of the Ice Age, which was destined to modify profoundly the entire relief of the Alps. The whole of the Alps was covered by a great ice-sheet, with the exception of the south-eastern and south-western extremities, mainly in Styria, parts of Carinthia, and Provence. Only the higher peaks stood up above the level of the ice in a manner similar to the *nunataks* of Greenland at the present day. The Ice Age, which was spread over a long period of time and here included four periods of glaciation with three warmer and drier interglacial periods, produced many and various results. To the Ice Age must be attributed the sharp outlines to be found in the High Alps and the frequency of the horn or pyramid-shaped peaks, which were exposed to the fierce denudation of frost and ice as they stood above the snowfields. The valleys, also, which had begun to be incised owing to the epeirogenic movement, were filled with glaciers, whose pressure as they moved along scooped out the pre-existing main valleys and over-deepened them, leaving the typical flat-bottomed, steep-sided valleys known as "U-shaped," *e g.* Lauterbrunnen, Upper Rhône, Vorder Rhein, and hundreds of others. The sides of the mountains beneath the peaks and above the main valleys were covered, on the other hand, with almost inert ice and were protected from both types of erosion, so that a shelf of gently rounded forms is usually to be found in this position, and the streams often tumble down from these shelves to the main valley by means of waterfalls. In the eastern Alps, especially on the outer borders where the mountains are lower, the higher parts more rarely rose above the snowfields and there are fewer sharply pointed peaks; on the contrary, the old peneplane surface can often be recognised at the top of steep-sided "towers" or "blocks," as in the Steinernes Meer south of the Königsee near Salzburg. Space forbids more than a brief mention of the Alpine cirques, the irregular profiles of the main valleys, and the numbers of small lakes, for whose origin the reader is referred to works on physical geography. The presence of

the great lakes on the borders of the mountains is a distinctive feature of the Alps alone among the young folded mountains of Europe, though similarly placed lakes are found in the Scandinavian highlands. Here in the Alps they often occupy over-deepened U-shaped valleys and tongue basins, which are often blocked at the outward end by accumulations of morainic material.



[Photo C W Johnstone]

FIG 76—VIEW TAKEN IN WINTER OVER THE AROSA VALLEY,
CANTON GRISONS

The range here shown, which separates Arosa and Davos, is a very minor one for the Alps, but exhibits the characteristic pyramid-shaped peaks, and the gently sloping lateral shelf above the steep-sided main valley. The shelf on the far side of the valley is forested, mainly owing to its unfavourable northerly exposure, while that from which the view was taken has been cleared for cattle pasture. The vast scale of the photograph can hardly be realised unless the frozen lake in the right centre can be picked out: this lake is sufficiently large to act as a landing ground for aeroplanes, and it is surrounded by large hotels which appear in the picture as mere dots.

Lithological Material.—The description of the main lithological zones of the Alps has been postponed until this point in the chapter in order to make clear that the present land-forms are due more to the processes of peneplanation, rejuvenation, and glaciation than to the character of the rocks. For instance, though the high peaks are generally to be found in the crystalline zone, they are not confined to this belt, as the limestone giants of the Bernese Oberland testify, *e.g.* Eiger, Wetterhorn, Diablerets, etc., and even relatively unconsolidated deposits can form mountains of quite dignified dimensions,

as in the case of the Tertiary conglomerates of the Rigi. Similarly, areas with rounded relief are to be found on all the formations.

Fig. 77 gives the main facts of the disposition of the rock zones. The interior zone, which consists mainly of highly crystalline rocks interspersed with bands of slates and shales, belongs to several nappes, including the Tirolid, Grisonid, and Pennine, mainly the Tirolid in the eastern Alps east of the Vorder Rhein and the Pennine in the western Alps. The old Hercynian masses also form part of this inner crystalline belt, and like the crystallines of the nappes are formed of highly resistant rocks, such as gneisses and granites which weather very slowly. In contrast to the crystalline rocks, which stand out as the main chains of the inner Alps, the slates and shales are much more easily eroded and the slopes are often milder than is usual for the High Alps, while excellent pastures are more than usually extensive, as in Canton Grisons (Switzerland) and the Kitzbuhler Alps (Austria).

On the southern side of the crystalline zone in the eastern Alps is the southern limestone zone, belonging to the Dinarides. This thins out westwards and disappears altogether a little to the west of Lake Maggiore. Farther west the crystalline zone abuts directly on the alluvium of the North Italian plain.

A northern limestone zone lies on the northern side of the crystallines, but this is a very composite belt. In the eastern Alps of Bavaria and Austria the limestones belong to the Tirolid nappe; west of the River Arve in the French Alps the limestones do not belong to a nappe at all, and instead of being transported over long distances were folded more or less *in situ* and are therefore called autochthonous.

Climate and Vegetation.—The Alps lie in two main climatic subdivisions of Europe, the greater part falling within the region of Central-European climate and the southern part, roughly south of 45° N., in the Mediterranean zone. The latter consequently is a region of summer drought, while the mass of the range has precipitation all the year round, with a maximum in summer in the northern Alps, in autumn on the Italian side.

As in all mountain chains the climate varies very much according to the height and degree of exposure to the prevailing winds and to the sun. The slopes facing north

are naturally colder than those facing south, and the wide valleys, which become veritable hot-houses in summer, yet suffer from a temperature inversion in winter and are

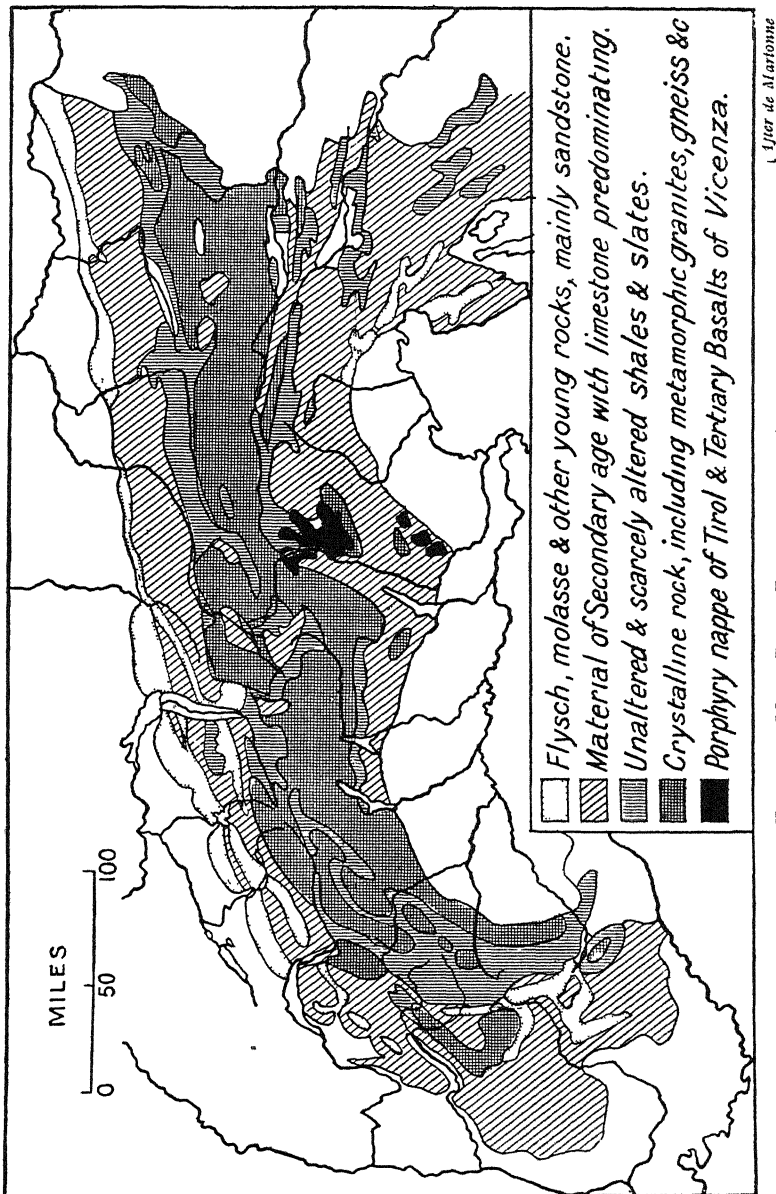


FIG 77—MAIN ROCK ZONES OF THE ALPS

colder than the slopes above. In winter, indeed, the region above 3,000 or 3,500 feet generally has a much more pleasant climate than the lower land, as it is above the level of maximum cloudiness and usually enjoys bright, sunny days with dry, still air, whereas the valleys may be filled with a chilly mist. In summer the cloud belt rises higher, owing to the greater warmth and consequent development of rising currents of air, and the lower valleys are sunnier than the higher regions, though the high peaks above 7,000 or 8,000 feet often rise above the clouds.

The precipitation is naturally heavier than that of the surrounding plains, but is not as high as that on much lower mountains in the Atlantic climatic region. The interior valleys in particular have a low precipitation, often less than 30 inches, especially in Switzerland and Austria, hence the need for irrigation of many of the valleys. The outer ranges of the eastern Alps have copious precipitation, often exceeding 80 inches, while the Venetian Alps deriving their rain from Mediterranean cyclones have twice that amount in places. The Alps of Savoy also have a heavy rainfall. The precipitation in winter usually falls in the form of snow, practically the whole range being snow-covered for at least three months in a normal winter, while the snow often lies for six months above about 6,000 feet. The lower limit of everlasting snow naturally varies with the latitude, with the exposure to the sun, with the amount of precipitation, as well as with altitude, and it comes down as low as 8,000 feet in the northern Swiss Alps and reaches as high as 10,500 feet in the drier central Alps. The lowest glacier (the Lower Grindelwald in the Bernese Alps) ends as low as 3,500 feet, but this is rather exceptional.

Owing to the great contrasts in temperature resulting from differences in altitude there are a great number of local winds. The Fohn wind is due, however, to differences of pressure between the Mediterranean basin and the plains of central Europe, and it blows when a marked cyclone is passing across Europe on the northern side of the Alps. It is usually described as a warm dry wind from the south and is a notorious "eater of snow" and so is welcome at the end of winter, but when the Fohn is roaring among the forest trees the sky is usually overcast and the rise of temperature from just below to just above freezing-point has the effect of making the atmosphere

feel both damper and colder, so that in mid-winter all welcome the end of the Fohn and the return to the typical winter climate with its warm, bright sunshine and calm air, even though the temperature *in the shade* is lower.

The vegetation of the Alps is naturally closely bound up with the climate. Where the Central-European climate prevails magnificent summer pastures of grass (the true *alp*) are found beneath the snow-line. Below these comes the zone of forests, whose upper limit is about 5,900 feet, but has often been lowered by man, while its lower limit is about 2,600 feet, though again it has been largely encroached upon. The forest generally remains both on the steeper and shadier slopes, and in spite of having suffered attack both from above and below, it is still the most extensive vegetation zone of the Alps. It is mainly composed of conifers, but includes deciduous trees near its lower margin.

In the Mediterranean Alps both grass and forests are more rarely found, and the prevailing vegetation consists of Mediterranean shrubs resistant to the summer drought. In regard to cultivated vegetation the Alps are a region principally of forage crops, used as food for dairy cattle, but in the broad longitudinal depressions, such as the valleys of the Isère and the Inn, maize is widely grown, and the vine also has a considerable place, being cultivated up to a height of about 2,600 feet on the sunny slopes. In the lower valleys of the Mediterranean Alps the olive is cultivated as well as the vine and other fruits, and on the higher slopes the pasture is utilised mainly by sheep, as it is generally not sufficiently rich for cattle.

Alpine Routes.—The Alps with their sunny slopes and valleys provided a more favourable home for early man than the marshes and forests of northern Europe, and were well populated and the passes known and crossed in prehistoric times. In historic times the position of the Alps between Italy and the lands farther north led to their exploration by the Romans, and to the construction of roads connecting the homeland with the colonies across the mountain chains. This directed traffic on to a few lines of movement, such as the Mont Genève, Little St. Bernard, Great St. Bernard, and Brenner routes, which were used for centuries until the roads decayed with neglect in the Middle Ages, during which time hundreds of passes came into use again for the pack animals which

transported the goods of the Mediterranean and the Orient to northern Europe. The construction of military routes by the rulers of Austria and Savoy in the eighteenth century, followed by Napoleon's military roads, of which the Simplon was the most noted, led once more to concentration on a few arteries of movement, a concentration intensified by the construction of the trans-Alpine railways, though the improvement in motor-cars and the growing tourist traffic has led to the construction of a modern road-net penetrating all the main valleys and utilising a considerable number of passes.

In spite of their height and width, the Alps are a relatively open mountain range, mainly on account of their great longitudinal valleys. The transverse valleys also, such as the Ticino, Reuss, Adige, Dora Baltea, etc., provide most valuable lines of movement penetrating deeply into the mountains, but these are often obstructed by gorges, which baffled the early travellers, so that many of the apparently direct routes were not used until the late Middle Ages or early modern times. For instance, the St Gothard route came into use in the thirteenth century following the building of a bridge across the Schöllenen Gorge which the Reuss has cut through the granites of the Aar massif. Similarly, the direct route to the Brenner Pass by the Adige-Isarco valley was not used until the fourteenth century, owing to the obstacle of the Isarco defile through the porphyry plateau from Klausen (It., Chiusa = "gorge") southwards. The Simplon was not much used until Napoleon's road was built across it.

The modern railways generally follow the most important of the old roads, partly because they utilise the same ways of approach to the main passes, and partly because the old roads selected out of the many possible routes those which afforded the shortest path between the goals of movement. It is fairly easy to cross the Alps by circuitous routes if time is no object, but good direct routes are few and far between. Most of the railway routes solve the difficulty by means of tunnels, which though difficult and costly in construction enable the traveller to cross the western or central Alps in a little over two hours. The first of these great Alpine tunnels, the Mont Cenis, built in 1871, and seven and a half miles long, occupied fifteen years in construction, and linked Genoa and Turin with Lyons, Paris, and ultimately London. The valleys leading up to it are the Dora Riparia on the

Italian side and the Isère-Arc on the French. Farther towards the east, the next two trans-Alpine railway routes, the Simplon and the St. Gothard, both traverse Switzerland and unite at Milan on the Italian side. The Simplon tunnel, twelve miles long, built a quarter of a century later than the Mt. Cenis, took only eight years in construction as the result of the increase in experience during that interval. On the Italian side the tunnel is approached along the Toce valley, but on the Swiss side the route debouches on the longitudinal furrow of the Upper Rhône—along which the railway continues westward to Lake Geneva and Paris—and another tunnel, the Lotschberg, had to be constructed (in 1912) in order to pierce the Bernese Alps and connect up with the Swiss plateau. The Lotschberg-Simplon line is widely used by English travellers coming from the Channel ports by the new route which traverses Champagne and avoids the *détour via* Paris. The St. Gothard route, which culminates in a tunnel twelve and a half miles long, utilises the Ticino valley on the Italian side and the Reuss valley on the Swiss, and is the main route linking Genoa and Milan with Zurich and western Germany, and is also much used by traffic from England, Belgium, and Holland. Both the Lotschberg-Simplon and the St. Gothard routes serve much the same area and emphasise the importance of this line of movement. The St. Gothard had the initial advantage over the Lotschberg-Simplon in having only one mountain chain to cross and therefore needing only one main tunnel. The Brenner route connects the eastern part of the North Italian plain with central Germany. The approach valley of Adige-Isarco on the Italian side gives a direct south-north route for three-quarters of the way across the Alpine range, but on the northern or Austrian side the route leads down into the longitudinal valley of the Inn at Innsbruck, and further chains have to be tunnelled before the railway emerges on to the Alpine Foreland of Germany. The Brenner Pass is only 4,495 feet high and no long tunnel was necessary.

East of the Brenner the Alps are lower but broader and more complex, and routes tend to be more circuitous. Moreover, the main direction of movement, between Vienna and the head of the Adriatic, is oblique, and longitudinal valleys are considerably utilised, particularly the Mur-Mürz leading up to the Semmering Pass, but there are several other important routes, like

that utilising the Klagenfurt depression to the Venetian plain.

International expresses also use the composite longitudinal depression between Lake Constance (Boden See) and Vienna, following the Inn, Salzach, Enns, and other valleys, though the trains are slow judged by English standards. Mountain railways are plentiful, especially in Switzerland, and carry tourists high up the mountains.

The main advantage which the railways possess over the roads in the Alps, at least, for trans-Alpine travel, is their greater freedom from obstruction by snow, so that the main lines and even most of the branch mountain lines are open all the year round, whereas the roads are apt to become impassable in winter; in fact, very few of the road passés are practicable from November to May or June, and the autobus services do not run.

Industries in the Alps.—The main industries are those of forestry and dairying in the greater part of the range, and sheep-rearing in the southern zone with Mediterranean climate. The tourist industry is also of great importance in certain areas, particularly in Switzerland, and still newer is the hydro-electrical industry utilising the great water-power of the Alpine torrents. Manufactures utilising this power are increasing. (See chapters on the various Alpine countries.)

REFERENCES

Les Alpes, by E. de Martonne, gives an excellent short account from the geographic point of view. On structure the following may be noted, though they are intended for the geological rather than the geographical student. *The Structure of the Alps*, L. W. Collet (London, 1927), deals mainly with the central Alps in Switzerland and France. *The Nappe Theory in the Alps*, F. Heritsch, trans. P. G. H. Boswell (London, 1929), gives an impartial account of the various theories of structure. *Bau und Entstehung der Alpen*, L. Kober (Berlin, 1923), and *Bau der Alpen*, R. Staub (Bern, 1924), are classic geological works. On glaciation *Die Alpen in Eiszeitalter*, by A. Penck and E. Brückner (3 vols., 1901–9), is the classic work.

CHAPTER XXIV

SWITZERLAND

WITH an area of 15,940 square miles Switzerland is one of the smallest countries of Europe, and with 60 per cent. of its surface lying in the Alps and 11 per cent. in the Jura Mountains it is also one of the most mountainous. More than half the population is to be found in the plateau lying between these two mountainous zones, though "plateau" is rather a misnomer, as the Tertiary sandstones, conglomerates, and marls (*Molasse*) of which it is composed are so dissected that in many places it appears to be only a succession of hills.

The Swiss Plateau.—This stretches from Lake Geneva (Lac Lemman) north-eastwards to Lake Constance (Boden See), with a length of 180 miles and a maximum breadth of only 30 miles. Not only was it dissected by rivers, but it was afterwards covered entirely by a great ice-sheet formed by the fusion of the great Alpine glaciers at the time of maximum glaciation, though the last glaciation produced only valley glaciers in this area. The various phenomena resulting from the glaciation of a more or less lowland region are present here in great variety, namely, disturbances of the river system, deposition of ground moraine and formation of drumlins, deposition of coarser material from the terminal and lateral moraines which now often forms hills, and deepening and broadening of the valley floors. The Swiss plateau, therefore, shows an alternation of flat-bottomed valleys, often rather wide, with somewhat steep-sided hills which tend to flatten out on top, though the unevenly deposited morainic material with its apparently haphazard distribution disturbs the general scheme. The plateau as a whole varies in height from some 4,600 feet near the Alpine border to some 1,300 feet at the foot of the Jura, and the difference in height between the valleys and summits varies from about a thousand feet in the south-eastern border to a hundred or so on the northern.

The Swiss plateau has the advantage over the neighbouring Alps and Jura in the greater ease of movement, the

lower altitude and warmer summers, and, in consequence, out of the twenty-five Swiss towns of over 10,000 inhabitants, eighteen are on the plateau. The plateau communicates south-westwards *via* the Rhône valley to the Saône-Rhône depression in France, northwards to the Rhine rift valley, and north-eastwards to the German part of the Alpine Foreland. In itself the plateau is a region of intensive agriculture, for though the winters are cold, cloudy, and often foggy, the summers are warm and rainy and provide ideal climatic conditions for artificial meadows and the production of forage crops, as many as six mowings being sometimes possible in the year. Contrary to general belief, it is the plateau and not the Alpine or Jura zones which carries the greatest number of dairy cattle in Switzerland, though the cattle are mainly stall-fed and are seldom visible on the land, except in September, when they are turned out on to the mown fields. This great concentration on dairying is fairly recent. Before the era of cheap imported grain the Swiss plateau necessarily grew its own cereals, but their area is now much reduced. Other crops such as beet-sugar and tobacco are also grown, especially in the south-western part of the plateau. The vine is grown, mainly on the sunny northern slopes above Lake Geneva and Lake Neuchâtel. Orchard trees are to be found planted along the roads in this land where no space is wasted on hedges. Where the hill-slopes are too steep for cultivation they have been retained under forest, originally mainly deciduous, but generally reafforested with conifers.

Considerable but scattered manufactures are to be found over the plateau, mainly using hydro-electricity as power. The manufacture of cheese is widespread, that of Swiss condensed milk and chocolate somewhat more localised. The textile industry is mainly in the north of the plateau, Zurich being the centre of the silk industry established there in the sixteenth century by Italian refugees, and St. Gallen of the cotton textile and embroidery industry, which developed on the basis of an old hand-industry but which received a fresh impetus from French refugees in the eighteenth century. The manufacture of machinery, textile, hydro-electric, and many other types, is carried on in the north of the plateau and at Geneva. Since the industries are not usually dependent upon coal, they tend to be much scattered throughout the countryside (*cf.* Sweden).

The plateau also has its share of the tourist industry, particularly in the regions bordering Lake Geneva and Lake Lucerne (Ger., Vierwaldstätter See).

Of the towns of the plateau, Zurich (250,000),¹ on the lake of the same name, is the largest, and possesses a very varied industry, including machinery, cotton, leather, etc., in addition to the silk already mentioned. It is also an important commercial and intellectual centre. Geneva (142,000), at the western end of Lake Geneva, and formerly capital of the Calvinist state of the same name, is the largest town of the French-speaking part of Switzerland. It is a banking centre, possesses watch-making and luxury industries, and is the seat of the League of Nations. Berne (112,000), almost surrounded by a great incised meander of the River Aar, is the federal capital and manufactures watches. Only three other plateau towns have more than 50,000: Lausanne, mainly a tourist centre, St. Gallen, noted for its embroideries, and Winterthur, which manufactures machinery. The population tends to be scattered in small towns and villages.

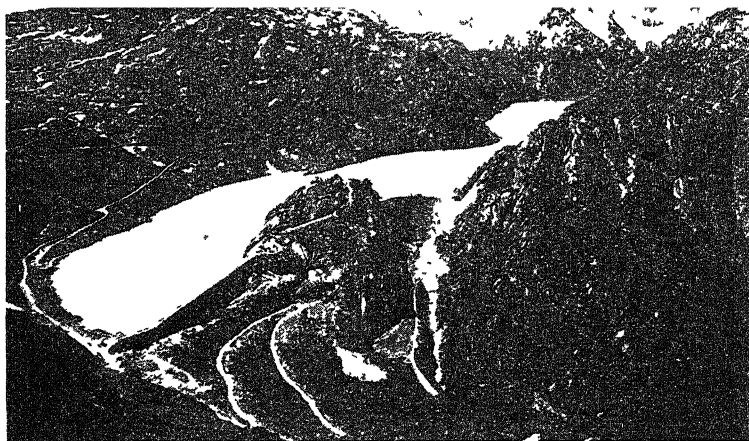
The Jura.—The structure of the Jura has already been described. Switzerland possesses the south-eastern folded portion with many parallel ridges and valleys. The range becomes lower and narrower towards the north-east, and where it interposes between Basel (Fr., Bâle; conven. English, Basle) and the plateau it forms a comparatively slight obstacle. Dairying and forestry are the dominating industries of the Jura, with vine-growing on the south-eastward facing outer slope overlooking the plateau. The making of watches, particularly at la Chaux de Fonds, is noteworthy.

Basel (148,000) is the great railway junction at the southern end of the Rhine rift, where routes fan out all over Switzerland. It manufactures chemicals and machinery and has specialised also in the manufacture of silk ribbons.

The Swiss Alps.—The main lines of structure have already been described. Switzerland possesses a segment of the central part of the Alps where they are highest and narrowest, and in one place reaches across the whole width of the range to touch the North Italian plain south of Lake Lugano. The main industries are forestry and dairying, to which has been added during the last fifty years or so the great tourist industry. This developed

¹ Population figures are from the 1930 Census.

originally owing to the magnificent scenery of the Swiss Alps and their nearness to those countries of Europe whose inhabitants had money to spend on such holidays, and it has been fostered in every possible way by the provision of good hotels, roads and railways, and so on. The textile industry of St. Gallen also extends into the Alpine zone.



[Courtesy Swiss Federal Railways]

FIG 78 —THE GRIMSEL STORAGE BASIN, BERNESE OBERLAND

This artificial lake is $3\frac{1}{2}$ miles long and has a storage capacity of 3,500 million cubic feet. The dam in the centre of the picture is 375 feet high. Storages are necessary in connection with most of the Alpine hydro-electricity schemes, as about 95 per cent. of the total annual flow takes place in the six summer months.

The Swiss State and People.—Although possessing a total population of only just over four million, Switzerland recognises three official languages, various dialects of German being spoken by 70 per cent. of the people, French by 21 per cent., mainly in the south-west, and Italian by 6 per cent., mainly in Canton Tessin. In addition, other languages descended from Latin are spoken in the Alps, particularly Romansch, spoken in Canton Grisons (Graubünden). This recognition of the rights of people to speak their own language is in accord with the large amount of autonomy possessed by the separate provinces

or cantons, and this autonomy dates back to the thirteenth century, when the four cantons round Lake Lucerne organised themselves into the Swiss Confederation on federal and democratic lines.

The considerable importance of Switzerland at the present day, in spite of its small size, is largely due to the recognition by the Swiss of the advantages of their geographical position and resources, and to the neutrality which they have long enjoyed. The favourable position as a passage land across the Alps was early realised by the original cantons of the Swiss Confederation which lay athwart the St. Gothard route, while the development of the tourist industry on an unsurpassed scale is one of the latest examples of the grasp by the Swiss of the advantages of their situation. Their consistent neutrality led to the influx from the surrounding lands of many refugees, who brought with them various crafts, such as silk-making, fine watch-making, hitherto not practised in the country. Also the democratic nature of the country, with an absence of landed aristocracy, meant that capital was not locked up in land but was free for further investment in industry. Switzerland indeed offers many points of contrast with its neighbour Austria, which began also as a small country of the mountains, but expanded over wide areas eastward, only to be reduced once more to an Alpine state in 1919.

Economic Summary.—The productive area of Switzerland covers 75 per cent. of the country, of which 22 per cent. is forested, 41 per cent. grassland, and only 12 per cent. arable. Agriculture is less important than formerly and only a quarter of the population is now engaged in it. Nearly half the population is occupied in industry and the remaining quarter in commerce, administration, education, the hotel industry, and transport. The metallurgical industry occupies some 224,000 people, the textile 140,000, watch-making 60,000, the hotel industry 43,000. The total water-power is estimated at three million horse-power, of which over half is utilised, but a small amount of coal must still be imported.

The imports exceed the exports, but against this must be set the profits of the hotel industry.

Imports include cereals, raw material for textiles and textiles themselves, minerals and mineral manufactures, chemicals, including fertilisers. The exports include silk and artificial silk goods, cotton goods,

especially embroideries, machinery, clocks and watches, and animal food substances, especially condensed milk and cheese.

REFERENCES

Dictionnaire Géographique de la Suisse, 6 vols and atlas (Neuchâtel, 1902-1910), was for long the standard work. A new monumental work *Geographie der Schweiz*, by J. Fruh is being issued—Vol I, 1930, Vol II, 1932, Vol III, 1938 deal thoroughly with every aspect of Swiss geography. *Die Landschaften der Schweiz*, by P. Vossaler (Bern, 1928), is accompanied by a portfolio of 20 topographic maps, mainly composite sheets from official sources, which illustrate typical aspects of Swiss topography. See also *Switzerland from the Air* (Zurich, 1926).

Switzerland is very adequately mapped. See the topographic maps on the scale of 1 : 50,000 and 1 : 25,000 especially.

CHAPTER XXV

AUSTRIA (OSTMARK)

AUSTRIA, or Ostmark as it is now called instead of Österreich, retains its identity for some purposes, notably for Customs. It is a typical Alpine area, and stands geographically apart from the rest of the German lands, though it includes also a narrow strip of the Hungarian or Pannonian plain on the east, the Danube valley below Passau almost to Pressburg (Cz., Bratislava), and a small part of the "Bohemian" massif on the north.

With an area of 32,369 square miles Austria is twice as large as Switzerland, but its population of six and three quarter millions is only a third greater.

THE ALPINE REGION

The Austrian Alps spread themselves more widely than the Swiss Alps, but are lower and their great valleys are longer and wider and so the range is more easily penetrated.

Vorarlberg and Tirol.—The northern outer bands of Flysch and limestone lie inside old Germany, from Lake Constance to the Königsee south of Salzburg, and the Austrian provinces of Vorarlberg and Tirol are situated south of this outer strip. In the west the Vorarlberg touches the eastern end of Lake Constance, which forms the frontier of three countries. The frontier also adjoins Switzerland for a short distance along the Vorder Rhein, and touches the tiny independent state of Lichtenstein farther south. The southern part of the Vorarlberg includes part of the central crystalline zone, the Arlberg railway line running approximately along the line of junction between the limestones and crystallines from Bludenz to Landeck on the Inn. Vorarlberg is closely linked economically with Switzerland, the embroidery industry having spread here from St. Gallen. The Tirol similarly consists of a northern limestone band and a southern crystalline band, both with many peaks, the Inn valley from Landeck to Innsbruck marking the line of junction in the west, but east of Innsbruck a broad belt of slates

and shales (*bundnerschiefer*) interposes between the limestone and crystalline belts, and the Inn as far as Worgl follows the northern side of the slate zone and the southern side of the limestone belt. The longitudinal valley of the Inn between Landeck and Worgl forms the heart of the Tirol. The valley averages about a mile wide, the river itself being usually incised and the broad terraces being very intensively cultivated, maize being one of the leading crops (*see* Fig 79) Innsbruck (61,000 with suburbs), the largest town in the interior of the Alps, grew up at the point where the Sill valley (Wipptal), leading down from the Brenner Pass, reaches the wide Inn valley. The old

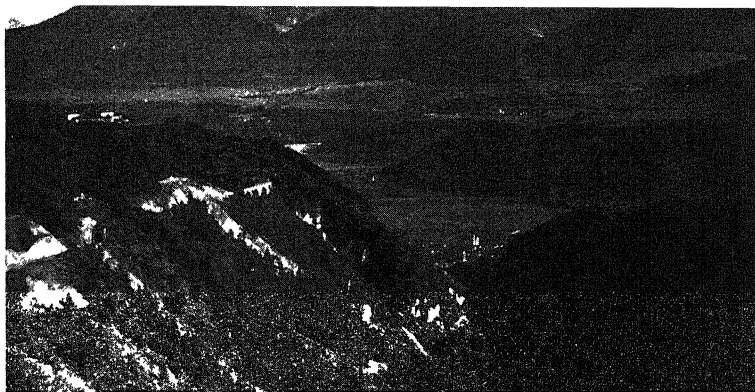


FIG 79 —THE INN VALLEY, NEAR INNSBRUCK

Note the wide terrace, high above the modern valley floor

bridge over the Inn, from which the town takes its name, allowed traffic going northwards to Munich, Augsburg, etc., to use one of the short routes across the outer limestone zone instead of following the Inn valley towards the north-east. The town is now a regional capital and tourist centre. The part of the Tirol south of the Brenner Pass has been lost by Austria to Italy, even though the northern part contains, or contained in 1914, nearly a quarter of a million German-speaking people.

The Northern Sedimentary Zone from Salzburg to Vienna.—The outer Flysch zone reaches from Salzburg as far as the Wiener Wald (=“forest of Vienna”), and

its rounded hills and mountains are mainly devoted to pasture. The limestone zone which succeeds the Flysch on the south almost reaches the outer border of the mountains south of Salzburg, and varies from forested mountains in the lower northern region to high, barren karstic plateaus in the inner and higher parts, *e.g.* Totes Gebirge, Steinernes Meer. This outer zone with its numerous lakes is well known to tourists, and so is the border town of Salzburg, which derived its name and wealth from the neighbouring salt mines of Hallein on the Germano-Austrian frontier. These important mines are still actively worked. Salzburg itself, with its castles, palaces, and gardens of the former archbishops, its musical festival and associations with Mozart, remains a small place (40,000)¹ of great charm, visited by many tourists.

South of the limestone zone a broad belt of slates and shales interposes in two places between the limestone and the crystalline zones. In the west the slates are continued from the Tirol and extend north of the Pinzgau, *i.e.* the longitudinal stretch of the Salzach, which marks their junction with the interior crystalline zone. East of the Pinzgau, the slate strip is missing, so that the crystalline mountains of the Niedere Tauern abut on the limestone belt, until the slates once more appear north of the Murz in the Eisenerz Alps, noted for their rich iron deposits, from which comes the greater part of the considerable amount of iron ore produced annually in Austria. The slate-shale mountains are generally lower than the zones to north and south and give rise to softer forms and better pasture.

The Interior Crystalline Zone.—The glaciated peaks of the Hohe Tauern generally rise above 10,000 feet, but farther eastwards in the Noric Alps of Carinthia and Styria, where the heights do not generally exceed 6,000 feet, the ice-sheet seems to have been absent or only very patchy, and rounded forms reminiscent of the Vosges or Massif Central are the rule and are often farmed up to the summits. The Mur-Murz depression opens a way from the Hungarian basin well into the eastern Alps, the Mur penetrating deeply into the crystalline zone. Brown coal is found in these valleys. The town of Graz (200,000 with suburbs), situated where the Mur emerges from the Alps, is the regional capital for this Styrian (Steiermark) part

¹ Population figures are from the 1934 Census.

of the Alps and for the productive foot-hills which border the lower valley of the Mur. The charmingly situated town has become also an industrial centre, using mainly the iron ore of Eisenerz and the lignites of the Mur-Mürz depression in its metallurgical industry, and manufacturing also paper and textiles. It is the second largest town of the country.

On the southern side of the crystalline zone is the southern sedimentary belt, the Drave valley west of Villach marking the line of junction. The Klagenfurt depression east of Villach is one of the largest of the Tertiary-filled basins which form a marked feature of the south-eastern Alps. The basin is highly cultivated, cereals, vineyards, and orchards flourishing in the summer heat in addition to the usual forage crops and meadows. The limestone Karawanken Alps on the south of the basin form the present frontier of Carinthia (Karnten), the southern part of Carinthia having been lost partly to Yugoslavia and partly to Italy.

The Danubian Lands of Austria.—East of the old frontier town of Passau the Danube hugs the southern edge of the Bohemian crystalline plateau as far as Krems; indeed, in places denudation has removed the overlying Tertiary sands and gravels of the Alpine foreland to such an extent that the underlying hard old rocks sometimes appear even on the south side of the river, which therefore flows through an alternation of basins and narrows. The Danube valley in the stretch between Linz and Krems, *i.e.* the Wachau, is noted for its unspoiled beauty and the river is here a wide, swiftly moving stream, whose speed can be realised from the fact that the tourist steamers take only seven and a half hours downstream between Linz and Vienna but seventeen hours upstream. In winter the river is often frozen and in spring the broken ice-floes sometimes get jammed and cause severe floods, hence the low-lying land bordering the river is usually avoided by homesteads and devoted to water meadows.

South of the Danube and north of the Alps the Alpine Foreland is continued from Germany where it is more widely developed. It narrows eastwards to a strip only about six miles wide east of the River Enns. In general the Foreland consists of hilly country of Tertiary sands and conglomerates. The higher parts (Hausruck, 2,600 feet) are forested, the lower parts mainly devoted to grass and forage crops and stock-rearing. Linz (109,000)

on the Danube is an old bridge town with considerable nodality, the Danubian route being crossed here by north and south routes from the Alps and Bohemian plateau. North of the Danube between the "German" frontier and Krems is the Waldviertel (= "forest quarter") on the southern extension of the Bohemian plateau. This is now largely cleared and devoted to pasture or to such crops as rye and potatoes, which are tolerant both of the poor soil derived from the granites and gneisses and of the rather bleak climate, the area being some 1,300 to 2,300 feet above sea-level.

East of a line joining Krems to Znaim on the River

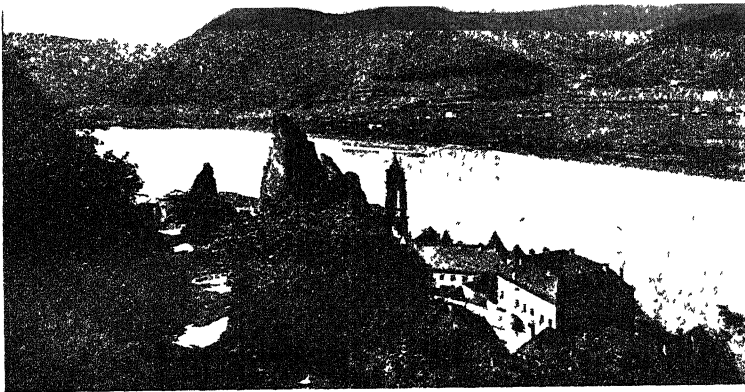


FIG 80 — THE DANUBE NEAR DÜRNSTEIN, WEST OF KREMS

In this part of its course, known as the Wachau, the Danube has cut into the crystalline rock of the Bohemian Plateau.

Thaya the old crystalline rocks sink under a mantle of Tertiaries, themselves usually covered by loess. Here the fertile soil and lower altitude give possibilities for rich cultures, including the vine, which has given the name of Weinviertel to this region. The Weinviertel is continued northwards across the frontier by the plain of Moravia, and south-eastwards it merges into the Vienna basin.

The Vienna Basin lies on both sides of the Danube for some sixty miles from north-east to south-west, but is only about a third of that width across. The part north of the Danube is usually called the Marchfeld. The whole basin represents an area of sinking in which Tertiary

sediments were deposited. It provides an area of lowland between the main ranges of the Alps and Carpathians, but is itself limited on the east by hills and mountains considered to be spurs of these ranges, namely, the Leithagebirge south of the Danube and the Little Carpathians north of that river. The Leithagebirge, though nowhere reaching more than 1,600 feet high and crossed by several railway lines, formed the frontier against the Hungarian plain, but the post-War addition of the German-speaking communities of the Burgenland in the western part of the Pannonian depression has caused the frontier to be moved some twenty-miles eastward. The Tertiaries of the Vienna basin are mainly concealed beneath fertile loess and river alluvium, and the area is highly cultivated.

The position of the basin is so important that a large city was almost bound to arise somewhere within it. In this neighbourhood the great natural line of movement from east to west, from the Hungarian basin along the Danube valley between the Alps and the Bohemian plateau, is met not only by routes coming from the north, namely, from the Moravian Gate and from the Upper Elbe, but also by routes coming from the south along the eastern edge of the Alps.

The actual site of Vienna (Ger., Wien) is at the foot of the Fylsch hills of the Wiener Wald (=Vienna Forest) on a river terrace just above the Danubian floods. The city takes its name from the little River Wien, a feeder of the Danube, and the old nucleus of the town kept a discreet distance from the main stream, which is here a braided river, though it bordered a small western arm, now known as the Danube Canal. In spite of works of regulation, very little building has taken place on the east bank of the main river, which is still liable to floods.

For several centuries Vienna filled the rôle of the most advanced bulwark of western civilisation against intrusion from the east, and continued to grow as the power of its rulers, the Hapsburgs, extended eastwards and northwards. Its present large size (1,900,000 in 1934) dates from the time when it was the capital of a great empire, of 242,000 square miles and fifty million people. Before the Great War it was the administrative and intellectual centre of the Austrian Empire, as well as the commercial, banking, cultural and recreational centre of a good deal

of south-eastern Europe. It was also, with its satellite towns, the most important manufacturing centre of Austria proper. To a considerable extent it began to function again after 1918 as a centre for a wide area, especially commercially, partly on account of its long-established traditions and experience, partly on account of its central position and its widely known language, and partly because of the need for such a centre in this much divided part of Europe. As regards industry, Vienna possesses manufactures very similar to those of Paris, and specialises in the manufacture of fashionable clothes, fine furniture, pianos, and luxury articles noted for their good taste and elegance. The old traditions of the city as a home of the arts, especially music, still continue to attract many tourists.

Economic Summary.—With the exception of Vienna the whole country is extremely rural, all the other towns, even Graz and Innsbruck, being sufficiently small for the surrounding mountains to loom large above the roof-tops. Nearly all the energy of the state seems to have gone into the capital city or into administering the Empire, and the countryside is generally less developed than in the corresponding zones of Switzerland. Less effort is made to exploit the Austrian Alps as a tourist resort, agriculture is run on less modern lines, and water-power is less developed. The small, picturesque towns often have the air of being two hundred years behind the times.

There is a much greater proportion both of forest and of arable land in Austria than in Switzerland, the forest covering 37 per cent. and the arable land 23 per cent. of the total area. The large amount of forest is a valuable source of wealth, and since the slump in the price of foodstuffs, including dairy produce, the relatively small amount of land under grass is little to be regretted. The amount of food produced in the country is insufficient for its requirements, however, largely owing to the great size of Vienna.

Austria is better off than Switzerland as regards minerals, and possesses a considerable surplus both of iron ore and salt. Its hydro-electric possibilities are much the same, but only half a million horse-power has been developed and more coal has to be imported, again principally for Vienna. The total home production of lignite amounts to three million tons.

Industry is confined mainly to the Vienna basin, Graz,

and the Vorarlberg, as already mentioned, though the wood and paper industries are naturally rather scattered

REFERENCES

Die Ostalpen und das heutige Österreich, by N. Krebs, 2 vols (2nd ed., Stuttgart, 1928), is the standard work. A valuable short account of the physical geography of the country is given by the same author in Baedeker's *Austria* (1930).

Two new series of topographic maps (in colour) are being issued on scales of 1 : 25,000 and 1 : 50,000, to take the place of the old 1 : 75,000 (in black and white).

SECTION V—SOUTH-CENTRAL EUROPE

CHAPTER XXVI

GENERAL INTRODUCTION TO SOUTH-CENTRAL EUROPE

THE countries included in this region are Hungary, Romania, Yugoslavia, Bulgaria, Slovakia, and Albania, with certain portions of adjacent lands, particularly the Carpathian portion of Poland and the European portion of Turkey. The Greek peninsula and islands are excluded on account of the contrasts in climate and in mode of life induced or fostered by differences in build and world position. On the other hand, the narrow coastlands of the north-eastern Adriatic and of the northern Ægean have been included here for the sake of clearness in dealing with their structure, but climatically and to some extent culturally they belong to the Mediterranean region.

This region of south-central Europe includes two great systems of young folded mountains, the Carpathian-Balkan and the Dinaric, and these enclose two great basins, the Pannonian (or Hungarian) and the Lower Danubian (or Bulgar-Romanian). The third important element is the crystalline mass of the Rhodope, which lies like a wedge between the Balkan and the Dinaric folded ranges and which probably continues beneath the Pannonian basin. The Pelagoman mass, which lies between the Vardar valley and Lake Prespa and extends into Greece, is similar in character to the Rhodope mass and only divided from it by a very narrow strip of country. Geographically they may be treated together. There are a few minor structural elements, such as the Dobruja Platform and the Tekir Dag, which stand apart from the rest of the area. Bessarabia and eastern Moldavia belong to the Russian Platform. (See Fig. 3.)

Physical Evolution.—The whole region probably lay beneath the sea in Cretaceous times. At the end of the Cretaceous era the Carpathian and Balkan folds emerged, to be followed in the Miocene period by the Dinaric system and by additions to the Carpathian system. At

the same time the Rhodope mass came into evidence, but sustained dislocations, with the result that large segments sank and fault-bounded basins were widely developed. In consequence, the ancient sea was split up into a number of lakes, of which the largest occupied the Pannonian basin, and as the waters of this lake stretched considerably beyond the present lowlands, sediments were deposited over the lands which now border the right bank of the River Sava as well as over the present Transylvanian basin. Another large lake deposited its sediments in the region of the Romano-Bulgarian basin, which was connected with the Pannonian lake by means of a strait occupying a transverse depression between the Carpathian and the Balkan Mountains. The Pannonian basin was also connected southwards with the branching Ægean lake, which occupied faulted basins in the present Rhodope and Pelagonian masses as well as covering what is now the northern part of the Ægean Sea.

It must be stated at once, however, that the present height and relief of the young folded mountains of this area are not due to the preliminary folding, nor even to the further folding that took place in Miocene times. Both systems of young folded mountains were subsequently reduced to plateau conditions and in some areas to peneplanes, and their present high elevation is due to subsequent epeirogenic rising. Both the Carpathian-Balkan and the Dinaric systems, therefore, show well-developed plateau forms, several levels being usually recognisable. The mountains present as a rule rounded bosses and wide upland slopes, which are often forest-covered and are reminiscent of such Hercynian masses as the Vosges or Black Forest rather than of the Alps or central Pyrenees. Alpine forms are entirely lacking in the Balkan Mountains, as their low elevation precluded a Quaternary glaciation. In the Carpathian system only the highest mountains show the characteristic Alpine forms, such as *arêtes*, *cirques*, etc. The Dinaric system also presents few Alpine features, and these are to be found mainly in the Prokletije (= "Damned Land"), sometimes known as the North Albanian Alps.

Owing to the recent slow re-elevation a number of rivers managed to retain their earlier courses. Such antecedent rivers are the Olt and the Isker. They usually break through the mountains in gorges owing to the lowering of the base-level of erosion.

In late Tertiary (Pliocene) times the fresh-water lake

which had filled the Pannonian basin began to be drained off and became divided into a number of smaller bodies of water, of which the present Balaton and Neusiedler lakes are remnants. Similar drainage took place in the Romano-Bulgar basin. The ancient Ægean lake and its branching arms remained for a somewhat longer time ; in fact, they were not drained off until the foundering of the northern Ægean, which probably took place in early Quaternary times. (See Fig. 94.)

In connection with the disappearance of these inland waters, there remain many terraces bordering both the ancient lakes and present river valleys, bearing witness to the intermittent manner in which the waters were lowered. These terraces, usually composed of fertile material of Tertiary age, and often loss-covered, are now usually much dissected by sub-aerial erosion, especially the older ones, and form a transition between the flat grain-growing basins and the bare or forested mountains. They provide good land for mixed farming and fruit-growing, and offer suitable sites for settlement. Consequently they are a feature of great geographical importance for this area.

In connection with the Tertiary earth movements there was much out-pouring of volcanic material, though there are no recent volcanoes. It seems, however, that parts of the region are still undergoing elevation, at any rate in the Dinaric system, but the Pannonian basin and Walachian plain have continued to sink and are largely covered with very recent sediments.

Modern Theories on the Tectonic Affinities of the Danube Region.—A beautiful if somewhat startling simplicity has been introduced into the structure of this area by the recent work of Kober and other geologists. The whole area is visualised as essentially forming part of one tectonic system only (See Chapter I, and Fig. 3.) The system of mountains known to geographers as the Dinaric is said to correspond to the upper or Dinaric nappes of the Alps, the Pelagonian and Rhodope masses are considered to represent *Zwischengebirge* or "median masses" similar to the masses of Corsica and Sardinia, and the Carpatho-Balkan system to correspond to the lower nappes of the Alps. The Rhodope mass is believed to underlie the Hungarian basin, as evidenced by hills with cores of an ancient rock, such as those between the Sava and the Danube, near Pecs, and the Bihor massif. These new theories are somewhat difficult to reconcile

with the older ones, especially as regards the Rhodope mass.

Climate and Vegetation.—The whole area, with the small exception of the Dalmatian coast, has cold winters. On the other hand, the summers are hot, except in the high mountains. Precipitation occurs all the year round, though in the form of snow in winter. Spring and summer are the rainiest seasons over the greater part of the area. Only in the extreme south and west is there a tendency towards summer drought, especially on the Dalmatian coast, in the Albanian lowlands, and on the north Ægean coast. (See table of climatic statistics at end of Chapter II)

The typical vegetation is deciduous forest, of Central European type, grading into coniferous forest. Hardly anywhere do the rounded summits rise above the tree level, so there is little true *alp* or *alm*. High pastures above the forest level have been formed or increased by clearing the timber in order to give summer pasture. In the most sheltered parts of the basins, where low rainfall is combined with porous soil, natural grasslands (usually of prairie character) occur; as in the Alföld, the Romano-Bulgar basin, and in the basin of the lower Maritza. These have mainly been utilised for the growing of grain, but in a few cases they are too dry and offer only grazing. Other exceptions to the usual forest-cover occur in regions of very pure limestone, such as the Karst region of the Dinaric system, and on a smaller scale in parts of eastern Serbia and in Macedonia.

The cultivated crops include both wheat and maize, the vine, and tobacco. Fruit trees flourish, particularly plums and apples, the rapid transition from winter to summer reducing the danger from spring frosts to a minimum.

Mineral Wealth.—The area is almost devoid of coal and iron, so that the main bases of present-day industrial development are absent. The only two minerals which occur in really large quantities are petroleum and salt, the former on the outer flanks of the Carpathians and the latter on both sides of that range. Metals occur in great variety, generally in association with the Tertiary volcanic activity, but the deposits are small. Considerable deposits of lignite exist, and there is some natural gas in the Transylvanian basin.

Water-Power.—There are no great possibilities for the

development of water-power. With only moderate rainfall, no perennial snow, and few lake storages, the area has no supplies of "white coal" comparable with those of Scandinavia, the Alps, or the Pyrenees. Moderate amounts are available, however, in the Carpathian system and in Yugoslavia. The large number of gorges gives opportunity for suitable power sites.

Historical and Economic Developments.—The lands of south-central Europe must be looked upon as backward compared with those of western and central Europe. Since they have little coal, iron, or water-power, one could hardly expect great industrial development, but even farming is in a primitive condition, with the exception of Hungary and the Slovene area of Yugoslavia. Subsistence farming is the rule, farm machinery is very primitive, and the rearing of livestock quite unscientific. The backwardness of these lands must be attributed largely to the fact that they bore the brunt of the Turkish attacks on Europe, and also to their position on the line of movement of most of the great earlier incursions from eastern Europe and Asia. With minor exceptions they all fell under the blighting Turkish rule. The lands of the north and west were the last to be conquered by the Turks and the first to free themselves. Hungary, for instance, was conquered by the Turks in 1526 and obtained its freedom in 1699, but the liberation of the countries nearest to Constantinople came very late. Rumania freed itself from Turkish suzerainty only in 1878, though virtual independence was established in 1861; the nucleus of modern Yugoslavia was formed in 1817, but the Niš area was not added until 1881 and the Vardar area not until 1912-13; independent Bulgaria dates only from 1881, and Turkish suzerainty was not definitely abandoned until 1908.

Great efforts have been made by all the countries concerned to catch up with western Europe. This is particularly evident in the rebuilding of the cities on modern lines. Naturally the Oriental influence was strongest where the Turks held sway for the longest time. In Skoplje, for instance, there are two distinct towns, the old Oriental town on the left side of the river, where the merchants still sit cross-legged in the great bazaar, and the well-laid-out European town on the right bank. Sarajevo is even more Oriental; in fact, it may be looked upon as a living museum, and its inhabitants still wear Turkish costume (now banned in Turkey itself), and

the women still veil their faces. In this connection it may be added that the Balkan peninsula contains the only section of Europe in which the Moslem religion is professed by any considerable numbers.

One of the results of the Turkish invasions was the flight to the mountains of large numbers of the agricultural people, where among the broken, forested country it was difficult for the Turks to attack and where the poverty of the country made it not worth while to do so. In the small fertile basins south of the Sava-Danube line the Turkish conquerors forced the local inhabitants into serfdom, whereas the peasants in the mountains retained their freedom. Portions of the great open plain were almost completely depopulated, particularly those areas which are exceptionally flat and offer no good defensive sites, such as the plains of the Banat and Muntenia. It must be remembered also that these dry, timberless, loss-covered plains were not suited to primitive subsistence farming, and like the prairies of North America and the Argentine pampa could only carry a scanty stock-rearing population, until modern technique and modern markets enabled these lands to be converted into grain-producing regions. The characteristic Walachian dwelling from the dawn of history may perhaps be related both to the constant danger from marauding invaders and to the conditions of vegetation and climate, since it consisted merely of a pit dug in the earth, with a roof of grass or reeds barely above the level of the plain.

The Magyars alone managed to retain their position on the open plain with any degree of success, but as they themselves were a horse-riding nation organised on a military basis and had played a rôle a few centuries earlier similar to that of the Turks, this is hardly surprising. Indeed, it was their sudden and unexpected collapse in 1526 that surprised the Turks and not the excellent resistance which they had hitherto maintained.

Apart from the Magyars, most of the population may be looked upon as having become refugees in their mountain fastnesses, where they were cut off from contact with western Europe and consequently from the changes that were taking place there. Somewhat in the manner of the "poor whites" of the Appalachian Mountains in America, old customs and beliefs and primitive ways of life continued. For instance, the country people wear their picturesque local costumes as a matter of course and

not, as in western Europe, self-consciously with an eye on the tourist. Illiteracy is high and superstition rife.

Similarly, old institutions such as serfdom lingered on after they had disappeared from western Europe. The Hungarian serfs, including those of Slovakia, Transylvania, and Croatia were freed in 1839, those of Romania in 1864, and those of the Balkan areas with the withdrawal of the Turks. The liberation does not seem to have been very beneficial to the peasants, however, and at the outbreak of the Great War there was a very pronounced land hunger, which was satisfied, particularly in Romania and Yugoslavia, by measures of agrarian reform which divided up the great estates and distributed the lands among the peasant farmers. Hungary still shows vast latifundia side by side with tiny holdings, but Bulgaria has long been an essentially peasant state.

Another feature of the politics of east-central and eastern Europe as a whole is the intermingling of peoples and the difficulty of drawing frontiers on national lines. This intermingling is the result of various causes. In empires as large as those of Turkey, Austria-Hungary, or Russia movements of peoples can take place more easily than between one nationalistic state and another. Also, in order to hasten the colonisation of the Banat and of Bessarabia the Austro-Hungarian and Russian empires invited settlers from outside their own dominions. Moreover, these lands attracted people from Serbia and Bulgaria, which were still under Turkish domination. Hence the population of these areas became exceedingly diverse. The late crystallisation of modern nationalistic states in this part of Europe led to the inevitable inclusion of considerable minority populations, the only alternative being wholesale deportations, as in the case of Turkey and Greece.

It will be seen, therefore, that culturally as well as in other ways, these lands of south-central Europe are transitional between north-central Europe and Russia.

REFERENCES

Part II of *Europe Centrale*, by E. de Martonne (Paris, 1931), and *Landerkunde von Mitteleuropa*, by F. Machatschek (Leipzig and Vienna, 1925), deal with the region north of the Sava-Danube line. For the region south of that line J. Cvijić's *La Péninsule Balkanique* (Paris, 1918) is the classic work. See also *Economics of Peasant Farming*, by Doreen Warriner (London, 1939), which deals with this important subject as regards Poland, Czechoslovakia, Hungary, Romania, Bulgaria, and Yugoslavia.

CHAPTER XXVII

THE MIDDLE DANUBIAN BASIN

THIS depression, also known as the Hungarian or Pannonian basin, rises on all sides to mountainous country. Its middle portion belongs to Hungary and its outlying parts are now divided between a number of states, namely, Romania, Yugoslavia, and Austria. As the area forms a physical unit, however, it will here be treated as a whole.

Not only was the area subsiding in Tertiary times, but it continued to sink during the Quaternary period. It contrasts, therefore, with the Transylvanian basin, whose Tertiary material is at the surface and has been much dissected. Sedimentation is still active in many parts of the Hungarian basin, particularly along the Tisza and the lower courses of its left-bank tributaries, *e g* Koros, Maros, and Temes, which are still liable to great floods, in spite of much labour expended in regulating their beds. Loss is found on much of the higher ground such as the old lake terraces and on the bordering hills, and also in the lowlands themselves, but alluvium and blown sand have covered up the loss deposits in most of the lowly parts.

The region must not be thought of as being entirely flat, though there are large stretches of level ground. The hills of central Hungary cross the Danube near Budapest and stretch from north-east to south-west. Another line of hills lies between the Drava-Danube and the Sava, where they appear under a number of different names but can be included under the heading of Croatian-Slavonian hill country.

The Danube is the only river which breaks through the surrounding mountain ring, though there are a number of relatively easy exits in the form of saddles and passes which are followed by railways and roads. Indeed, the surrounding mountains are not the barrier they appear at first sight, as they are threaded in numerous places by deep and broad valleys which give opportunities of penetration. Moreover, the surrounding ring of mountains both narrows and diminishes in height in a remarkable

manner in two places. The Karstic saddle is the most important of these, as it leads from the well-populated lands of eastern Austria and western Hungary to the head of the Adriatic. The second is the remarkable narrowing of the Carpathian mountain system near the headwaters of the Tisza.

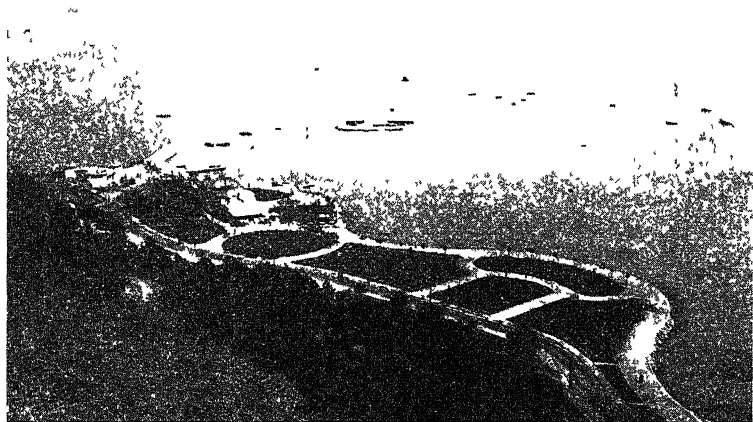
The Little Alföld.—This small, hill-girt plain is situated in the extreme north-west of the basin. It is separated from the Vienna basin by a line of hills running at right angles to the Danube and which may be looked upon as forming a link between the Alps and the Carpathians. The flatness of the middle portion of the basin allows the Danube to divide into several arms in a district that formerly was very swampy, but has been largely reclaimed and is now used for pasture or for the growing of vegetables. Southward the land rises, and late Tertiary deposits emerge from beneath the alluvium. Grain cultivation here becomes dominant, though there are also many orchards, which increase in number towards the southern foot-hills. This region is one of ancient settlement, in contrast to the recent development of the Great Alföld, and it contains a number of old picturesque villages and small towns, mostly of German origin. The river ports of Bratislava (124,000), in Slovakia, and Komárom (21,000), lie in this region.

The Hill and Plateau Region of Middle Hungary.—This may be divided into three parts. First, the mountains, largely volcanic in origin, which stretch in an east-north-east to west-north-west direction from the River Bodrog to the Danube. The greatest height reached is about 3,300 feet.

To the south-west of the Danube the Bakony Forest continues in much the same direction, with a maximum height of about 2,300 feet. The strata, of ages varying from Carboniferous to early Tertiary, are lightly folded and considerably faulted and may perhaps be connected with the Alpine folds. Both lines of hills retain a considerable amount of their deciduous forest cover, though much clearing has taken place.

South-east of Lake Baláton, which lies at the southern foot of the Bakony Forest and has a maximum depth of only 36 feet, lies a third section of this region. This is in reality a low, lightly dissected plateau covered with loss and therefore very productive. From this plateau north of Pécs and north of Székesfehérvár respectively,

rise two hill masses with granitic cores of which the former is the larger and higher, reaching 2,648 feet. These two groups of hills are considered to be vestiges of the sunken massif which underlies the whole basin and may be connected tectonically with the Rhodope block. Like the Little Alfold this region west of the Danube is a land of old settlements, with towns founded in the Middle Ages, and a population that has long been devoted to a diversified agriculture. The capital city itself, Budapest, originated in a settlement on the right bank of the Danube where



[Photo Hungarian Film Bureau, Budapest]

FIG 81 —LAKE BALATON FROM THE BAKONY FOREST

the hill country reaches the river. The original mediæval town of Buda has long been surpassed in size by Pest on the flat land across the river, but the dual city is still expanding rapidly in all directions. It is probably the most beautiful inland city of Europe.

The original settlement allowed possibilities of fortification on the hill of Buda, and the town had naturally a good position for trade. The river narrows at this point and is free from the braiding, cut-offs, and swamps which hinder movement north and south of the town. In the

old days when the river itself formed one of the main lines of movement traffic followed the river gap through the mountains to the north-west of the town. The modern Orient Express route passes through Budapest on its way between Vienna and Constantinople (Istanbul), but uses a gap to the south of the cutting made by the river.

The Great Alföld.—East of the Danube, between Budapest and Belgrade, the land stretches almost flat to the foot-hills of the Carpathian mountain system, though even here there is some physical contrast and the main unity is one of climate. This part of the plain has a



[Photo Hungarian Film Bureau Budapest

FIG 82 — PLOUGHING IN THE GREAT ALFOLD

more Continental climate than the regions already dealt with, and experiences severe winter cold and severe droughts in late summer. The natural vegetation is grassland, and hedges and trees are conspicuously absent, except for willows along the swampy borders of the few main rivers or where acacias and other drought-resisting trees have been planted round farmhouses and villages. Up to the early years of the nineteenth century the region was devoted to the rearing of horses, sheep, and, to a less extent, cattle. Nowadays the greater part is cultivated and there are only small areas, mainly those of loose, infertile sandy soil or swamp, which are not

¹ "Al" = low, "fold" = country or land

under the plough. The crops are very varied. Cereals, particularly maize and wheat, form the chief cash crops, though melons, tobacco, paprika, and many others are widely grown. Cattle are reared in large numbers, but are now mainly stall-fed instead of being turned loose to graze. Pigs and poultry, especially geese, are numerous, being fed mainly on the abundant grain.

Between the Danube and the Tisza lies a region which is higher and drier than the low-lying swamp country to the east of the Tisza River. This ~~Mesopotamian~~ region is largely covered with sand, now to a great extent devoted to vineyards, the vines on the sandy soil being especially free from phylloxera. Peaches and apricots are also widely grown near Kecskemét (82,000), which is a great fruit centre, the explanation of the productivity of this region being that the sand cover is usually thin and the loss can be obtained from below and mixed with the surface soil. Even so, the successful planting of trees in the Alföld demands great care and a special technique. South-east of Kecskemét the soil is impregnated with salts and there is a large area of *pusztá* (= "waste"), known as the Bugác steppe. Here may still be seen the original white Hungarian cattle. They can stand great heat and drought and make excellent draught animals, but provide little milk and fatten only slowly, so that on the better lands cross-bred cattle have been introduced in their stead. The place of butter on the Alföld is taken by lard, though of course butter can be obtained in hotels. South of Subotica (100,000), now in Yugoslavia, lies a fertile loss-covered region devoted mainly to cereal cultivation.

Part of the sandy region north of Debrecen (120,000)¹ has also been reclaimed for cultivation, though Hungary's largest area of *pusztá*, known as the Hortobágy, lies west of this town.

The population distribution on the Alföld shows some rather curious features. On the one hand is a concentration into large towns, which however usually retain much of the appearance of villages, or "garden cities," as their centres have few large buildings or shops to give an urban character, while the houses are usually of only one storey and each stands in its own garden. On the other hand, between the towns the population is extremely disseminated and the countryside is dotted with scattered farm-

¹ Population in 1936.

houses on smallish holdings, known as *tanyas*. The *Tanya* system was developed after the withdrawal of the Turks in order to cultivate lands which had been long neglected. At first the buildings were merely makeshift and the cultivators lived in them only temporarily, returning to the towns after the harvest was over, but some *tanyas* were permanent from the beginning, and in some regions, notably near Hódmezővásárhely, the *tanyas* give a very geometrical pattern to the landscape.

The Croatian-Slavonian Hill Country.—Between the Drava and Sava lies the Croatian-Slavonian hill country, a fertile, well-cultivated region broken by a line of hills running from west-north-west to east-south-east. These hills all contain a core of ancient rock and are believed by some geologists to be connected tectonically with the Rhodope and by others to be connected with the central crystalline Alps. Most of these hills retain a forest covering. The basins of Ljubljana and Zagreb belong tectonically to the Alps, and politically to Yugoslavia.

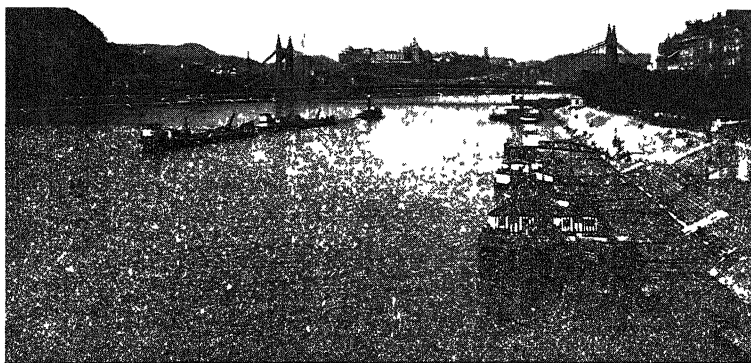
HUNGARY

The Hungarians entered the middle Danubian basin from the east in the ninth century. The name Magyar was at first confined to the clan of one of their great conquering chieftains, but was later, however, extended to cover all the Hungarian tribes or clans. Their earliest known home was between the Sea of Azov and the southern Urals. Their language belongs to the Finno-Ugrian group, of which Estonian and Finnish are the only other European representatives.

The Hungarians found the middle Danubian plain occupied only by a scanty population, which was composed partly of the disorganised remnants of earlier migrations, *e.g.* Avars, and partly of Slavonic-speaking people whom the Avars and others had previously conquered. The newcomers were able to establish themselves securely in the central plain, where they largely absorbed the existing population, and they extended their rule into and often beyond the surrounding mountains.

By forming a solid, coherent state in the middle of the Carpathian-Dinaric arc of mountains the warlike Magyars were in a very dominant position, particularly as easy routes led up into the mountains and afforded lines of penetration and settlement.

Their empire first showed signs of instability, however, in the fourteenth century, when Walachia emerged as an independent state and when at the same time the Serbs and Bulgars started to reassert themselves. The desire of these latter peoples for freedom was nipped in the bud by the Turkish conquests, but few of the peoples of the surrounding mountains became Magyarised, and after a thousand years of eclipse the Slavonic-speaking peoples (of Slovakia, Ruthenia, and Croatia), as well as the Romanians of Transylvania, became conscious of national aspirations, with the result that after 1918 Hungary was



[Photo Hungarian Film Bureau, Budapest

FIG. 83 —BUDAPEST FROM THE DANUBE.

Buda is on the high western bank, shown on the left of the picture, and Pest on the low eastern bank

reduced to a small state of 36,000 square miles (*i e* rather larger than the whole of Ireland) with $8\frac{1}{2}$ million people, of whom about 90 per cent speak Magyar.

Historically the Magyars had the misfortune to be placed between the advancing Turks and the rising tide of Germanism. Though allied to the Turks by race, yet the Magyars became so devoted to the European and Christian ideal that they for long formed a bulwark for western Europe against the Moslems. Their eventual subjection to the Turks took place at a particularly

unfortunate time when western Europe was emerging from mediæval into modern times. Consequently, through no fault of her own, Hungary lagged behind the western nations, and the subsequent struggle for independence against Austria further weakened her, so that not until after the *Ausgleich*, or compromise, of 1848 was Hungary free to make the great spurt which has brought her once more into a prominent position.

With its level surface of fertile soil, Hungary is pre-eminently agricultural. About 60 per cent. of the total surface is under the plough, a higher percentage than that of any other country in Europe except Denmark. Pasture covers about 18 per cent, forest 12 per cent, vineyards and gardens about 3½ per cent. Of the ploughed land about three-quarters is devoted to cereals.

The number of pigs, cattle, sheep, and horses is high, and the livestock industry may be compared in intensity to that of the Maize Belt of North America.

There is a large quantity of agricultural produce available for export, but one of Hungary's main difficulties is to obtain markets for her agricultural produce. Most of her neighbours are also agricultural countries, and Germany, her great industrial neighbour, has adopted a policy of agricultural and monetary self-sufficiency which puts great difficulties in the way of international trading. Hungary is able to export many commodities for which there is a demand in England, such as wheat, fruit (peaches, apricots, melons), good cheap wine, eggs, poultry, and game birds, but her inland position makes the transport a difficult problem, especially of perishable commodities, though the exports to England are increasing. It is rather curious, however, that the superfine Hungarian flour which has long enjoyed a great reputation in Germany should be practically unknown in England.

One would not expect to find great mineral wealth or water-power in a plain of Quaternary sediments, and Hungary's mineral deposits are limited to small amounts of coal, lignite, bauxite, and iron. Jurassic coal is found near Pécs and lignite near Salgotarjan and in the Pilis hills, north-west of Budapest. 5,931,000 tons of lignite were produced in 1934 and about three-quarters of a million tons of coal. Tiny quantities of iron ore are produced on the Slovakian borders near Rudabanya.

Industries are more developed than might be expected. Flour-milling is the most important, especially at Budapest,

Gyor (51,000), Debrecen, and Szeged (140,000) The sugar and brewing industries now work mainly for the home market, though there is an export of preserved meat (sausages) and other preserves

The machinery, textile, tobacco, and shoe industries are all quite important, especially at Budapest which concentrates over half the manufactures of the country

Budapest, with about $1\frac{1}{2}$ million people, holds a very dominating position in Hungarian life The city, which now numbers one and a half million people, is not only the administrative centre of the country, but the chief manufacturing and commercial centre as well as the seat of the leading university. It is also the chief health resort and holiday town, largely owing to the occurrence of natural springs of all kinds, which have been turned to good account both for recreation and healing purposes.

Apart from Budapest, none of the towns is of great size, and few are situated on the two great rivers The oldest towns occupy defensible positions west of the Danube, such as Székesfehérvár (lit =seat white town; cf German Stuhlweissenburg), which was the old capital as early as the 10th century Esztergom on the Danube is the "Canterbury" of Hungary, while Veszprém is the seat of a bishopric founded by King Stephen in 1001 The comparative absence of towns from the river banks in the Alföld is due to danger from floods, Szeged being practically destroyed by flood in 1879 Within the last 50 years however, great works of regulation have been carried out and hundreds of miles of protective dykes erected.

REFERENCES

Ungarns Land und Volk, by E von Cholnoky in *Ungarn* (Budapest, 1917) *Wirtschaftsgeographie des ungarischen Grossen Alfölds*, by Kurt Treiber (Kiel, 1934) *Hungary*, by Clive Holland (London, 1935) "The Danube as a Waterway," by H Ormsby (*Scott Geog Mag*, 1923) There are numerous publications in Hungarian, e.g. *Magyarország Földrajza*, by E von Cholnoky.

The standard topographic map is on a scale of 1 : 75,000. A new series is being issued on a scale of 1 : 25,000

CHAPTER XXVIII

THE CARPATHIAN SYSTEM

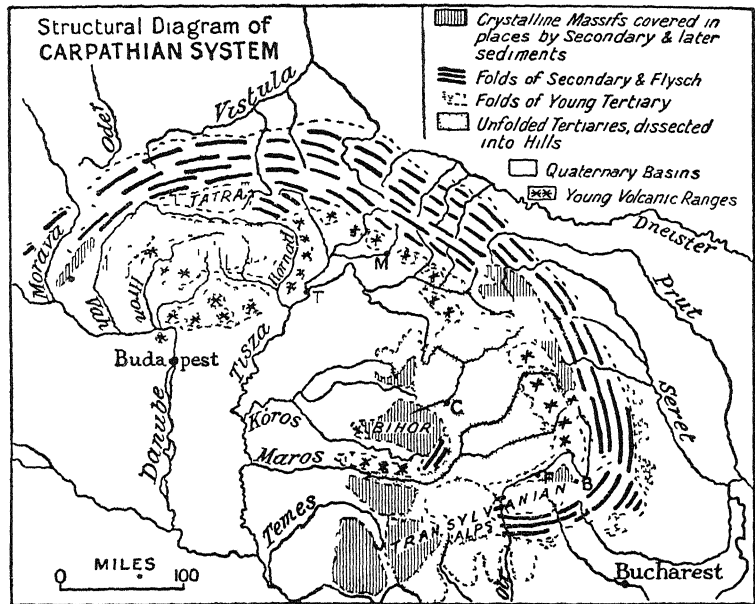
THE Carpathians, from the Vienna basin to the Iron Gate, have about the same length as the Alps, but they are only about half their average height and have no summit exceeding 9,000 feet. As a consequence of their position they have played a less important rôle in history, are much less important economically, and have a smaller and much more backward population. Although easier to traverse, there are considerably fewer railway lines across them. Less is known about the geological structure of the Carpathians than that of the Alps and they are much less adequately mapped. Owing to their lower height they possess no glaciers at the present day and there was less glaciation during the Great Ice Age. Accordingly there is very little Alpine scenery and therefore less to attract tourists. The Tatra Mountains alone present the phenomena of intense glaciation.

To a certain degree the Carpathians may be considered to be a prolongation of the north-eastern Alps, though the longitudinal zones do not correspond very closely and the nappes or *decken* are much less developed. One of the peculiarities of the Carpathian system is the great amount of block subsidence on the inner side of the mountain arc. The Hungarian basin almost divides the arc into two sections near the headwaters of the Tisza, and lesser subsidences are numerous. The subsidences are usually accompanied by volcanic outpourings of Tertiary age.

It is usual to subdivide the Carpathians into four sections according to structure and physical characteristics. The Western Carpathians stretch from the Vienna basin to the River Hornad, the Middle Carpathians comprise the narrow stretch between the latter river and the upper Tisza, the Eastern Carpathians continue almost as far as Braşov (Ger., Kronstadt), and the Southern Carpathians or Transylvanian Alps continue as far as the Iron Gate on the Danube. The Transylvanian basin

with its western mountain edge is sometimes included as a fifth division (See Fig. 84.)

There is no single longitudinal zone that continues throughout the whole length of the chain, though an outer sandstone or Flysch zone is present everywhere except in the Transylvanian Alps. Also a foreland of lightly folded Tertiary material is almost complete. An inner zone of crystalline rock is well represented in the Western Carpathians, disappears in the Middle Carpathians, reappears



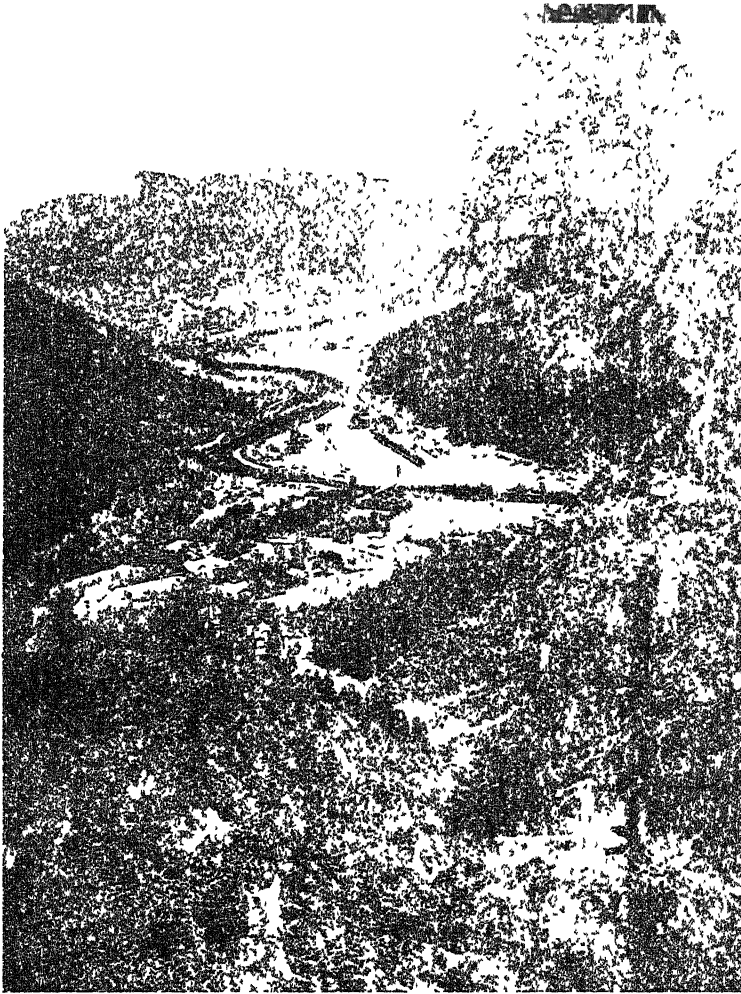
[After de Martonne.]

FIG. 84 —STRUCTURAL DIAGRAM OF CARPATHIAN SYSTEM.

as a narrow band in the eastern section, and composes the core of the Transylvanian Alps.

The Western Carpathians.—This section of the Carpathians differs in many ways from the rest of the mountain chain. The chain is here at its widest, highest, and most complex. At the same time it is deeply penetrated by longitudinal rivers, such as the Vah (Ger., Waag), Hron (Ger., Gran), and Hornad (Ger., Hernad), which flow towards the Pannonian basin, and it is studded also with numerous tectonic basins. Internal movement is therefore relatively easy and the region is fairly well penetrated by railway lines.

The Carpathians consist here of a series of structural zones which are concave to the south, with the exception of the most southerly one. The zones are not very easily



[Courtesy Czechoslovak Legation]

FIG. 85—LUBOCHŇA ON THE UPPER VAH, SLOVAKIA

One of the valleys which penetrate deeply into the Western Carpathians

distinguished from each other on the relief map, as they are only occasionally separated by well-marked depressions; moreover, the nomenclature offers difficulties owing to the

existence of three sets of names (*i. e.* Slovakian, Hungarian, German) for most of the physical features and human settlements. The zones may be termed briefly the northern, central, and southern, the first consisting mainly of rocks of Mesozoic age, the second mainly of ancient crystalline material often covered by Palæozoic and Mesozoic sediments (frequently of metamorphic character), and the third of young volcanic rock.

The northern or outer zone belongs to the Flysch nappe, which consists largely of sandstone. It forms a long range of hills and mountains, generally forested and of rounded



[Courtesy Polish Press Bureau]

FIG 86 —THE PEAK OF KOSCIELEC IN THE HIGH TATRA

The marks of glaciation are apparent.

form, which are known here under the name of Western Beskids. The range seldom exceeds 4,000 feet in height and is fairly easily crossed, indeed, the name Beskid is said to mean "passes." The Jablunkov Pass (1,808 feet) and the pass north of Zakopane are both followed by railways. Separating the northern zone from the central zone there is a fairly well marked line of depressions developed in soft marls, but not occupied by any master river.

The central zone follows the same general curve as the Beskids, but comprises much more varied material. This central zone has also been called the crystalline zone, but actually crystalline rocks as a rule appear at the surface only in the higher mountain masses, such as the Tatra,

and are more often concealed beneath later sediments. The zone is divided into outer and inner ranges, only clearly separated from each other in the region of the Liptov-Poprad depression in the valleys of the upper Váh and Poprad. In the outer zone the Mala Fatra and High Tatra Mountains are included among the best known ranges. The latter reaches a height of 8,737 feet and is the highest and most picturesque range of the whole Carpathian system. It is composed of resistant granites and received abundant glaciation during the Great Ice Age and now shows the typical pyramid-shaped peaks, cirques, arêtes, lakes, waterfalls, and so on, similar to those of the High Alps. The apparent height is enhanced by the surrounding basins, above which the range towers in majestic fashion. A number of tourist centres are to be found here, *e.g.* Zakopane (in Poland). The Polish frontier bends south in this region to include part of the northern side of the Tatra Mountains. The inner line of the central zone includes the Veľká or Great Fatra and the Lower Tatra as its best known ranges. These are composed largely of granite and gneiss, with an envelope of Triassic limestone, while east of the Lower Tatra and south of the Hornád are the Spiš Ore Mountains. These are composed of Palæozoic schists with ancient volcanic intrusions associated with mineral ores, particularly iron, though the iron industry established here in the Middle Ages by German settlers is now moribund. Iron deposits are also found in the crystalline massif south of the upper Hron. Finally the Slovakian Karst composed of Triassic limestone adjoins the Pannonian basin north of the Sajo (Sl., Slaná) depression.

The third or southern zone of the Western Carpathians consists of young volcanic material and is very discontinuous. The largest section lies athwart the middle Hron, and is often known as the Slovakian (formerly Hungarian) Ore Mountains. Small deposits of gold, silver, and copper occur and attracted German miners in mediæval times to places such as Schemnitz (Sl., Banská Štiavnica), though the ores are now unprofitable to work.

South of the Ore Mountains and Karst lies a well-marked depression filled with Tertiary and Quaternary deposits and studded with young volcanic material. The Ipel (Ger., Eipel) and Sajo utilise part of this depression, which separates the Western Carpathians proper from the volcanic Mátra and partially volcanic Bükk hills of Hungary.

To the east of the central crystalline zone occurs a broad faulted depression which can be traced by the north-south section of the Hornad River. The Torysa valley continues the route northwards almost as far as the River Poprad, which cuts transversely through the Flysch zone, so that a through route is offered between the plains of Hungary and Poland, with the longitudinal valleys of the Western Carpathians opening into it. Košice (Hung. Kassa ; 70,000), the most important town of the region, is to be found on this route. East of the Hornad fault lies a long line of volcanic hills, running north and south between the Hornad depression and the great bay of lowland that bites into the Central Carpathians. Tokaj, celebrated for its wine, lies at the southern end where these hills reach the Tisza.

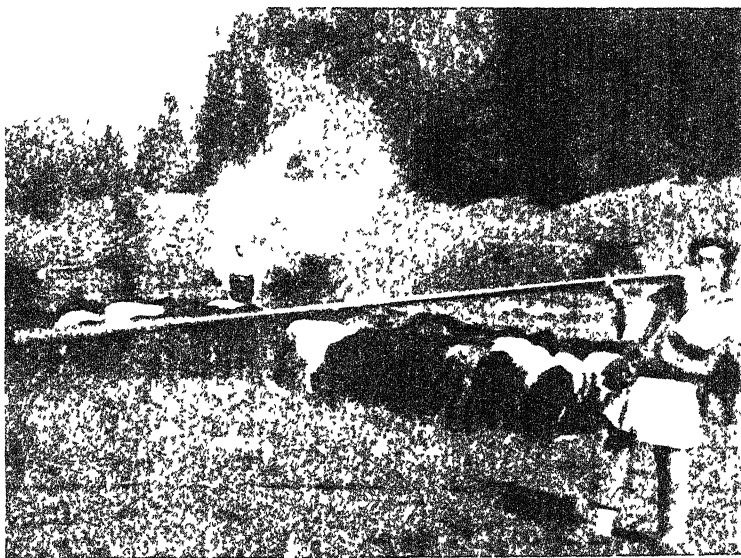
The Central or Forest Carpathians.—Here the width of the mountains is reduced to about sixty miles only. The mean height is much lower than elsewhere and several low passes, *e.g.* Dukla, Lupkov, Jablonica, connect the Hungarian plain with the Polish and Russian plains.

Only the Flysch zone is to be found here, known generally as the Eastern Beskids, accompanied by an inner line of young volcanic hills. Deposits of oil are found in the foot-hills on the northern side and worked mainly near Borysław (in Poland) and deposits of salt in the plains on the southern side.

Human Geography.—Apart from the Tatra and Fatra groups the mountains are generally forested to the summits. The broad basins and valleys are well cultivated, especially those opening southwards. The mountains are occupied almost entirely by people of Slavonic speech, Poles in the Western Beskids, Slovaks farther south, and Ruthenians on either side of the Middle Carpathians. Germans, descendants of the ore miners, are to be found mainly in the Spiš (Ger., Zips) district and in the Slovakian Ore Mountains. The Slavonic inhabitants, especially the Ruthenians, may be regarded as backward in comparison with the people of north-western Europe. The wearing of local costumes and the picturesque but primitive small towns reveal the cultural isolation of the region in spite of the physical ease of penetration *via* the valleys.

The Carpathian System in Romania.—The Eastern Carpathians stretch from the source of the Tisza almost as far round as Braşov. Apart from the foreland they

consist of the parallel ridges of the Flysch zone accompanied on the inner side by a long but narrow band of mountains belonging to the central zone, composed of crystalline rock accompanied by resistant limestones of Secondary age. The higher mountains are nibbled by cirques, but the majority show rounded forms and are usually well forested on the lower slopes with deciduous trees, especially beech, and on the upper slopes with conifers. Clearing has taken place extensively to afford grazing for sheep. West of the crystalline zone comes a



[Courtesy Royal Romanian Legation.]

FIG 87 —IN THE MOUNTAINS OF BUKOVINA

A corner of Europe where old customs and costumes persist

line of young volcanic mountains stretching southwards from the Borgo (Rom , Bargau) Pass, and known as the Kelemen (Rom , Călimanului) Mountains north of the River Maros and the Hargitta (Rom., Harghitei) Mountains farther south. The Hargitta Mountains apparently dammed back the drainage flowing westwards from the crystalline zone and produced lake-basins which are now the fertile, sheltered, and well-cultivated basins of Gyergyó (Rom., Gherghiu) and Csík (Rom , Ciuc), which offer a great contrast to the scantily populated mountains.

A third basin of similar appearance but of tectonic origin lies farther south between the Eastern Carpathians, here represented only by the Flysch zone, and the Tran-

sylvanian Alps. This is the basin of Braşov (56,000), from which the Predeal Pass leads south, carrying the railway line from Budapest to Bucharest. The Eastern Carpathians themselves are crossed by no main railway line, partly, no doubt, owing to the backward state of



[Courtesy Royal Romanian Legation]

FIG 88 —THE MOLDAVIAN CARPATHIANS. MT CEHLĂU IN THE DISTANCE.

economic development of the lands east of them, but also owing to their compact nature and to the difficult gorge-like character of their transverse valleys, the latter due to the late rejuvenation of the mountains and with them of the river system.

The Southern Carpathians.—The Transylvanian Alps are not, in fact, very Alpine in topography, though like the Western Carpathians they contain certain massifs which show well-marked pyramidal forms and other

results of glaciation. In the main they are sufficiently high for their summits to rise above the forest zone and they generally present fine scenery.

Structurally the Southern Carpathians belong to the so-called "central" zone, but here all the other zones are lacking except the foreland. The rocks composing the mountain chain have been acutely folded as in the case of the Alps, but the present topography rests upon a later sequence of events. Professor de Martonne has made a study of the physiographic development of the Transylvanian Alps (summarised *Geog. Rev.*, Vol 3, 1917), in which he found that there have been at least three periods of extensive peneplanation and rejuvenation. The Transylvanian Alps exhibit accordingly three series of flat-topped plateaus or shelves at different levels corresponding to the different periods of peneplanation. True Alpine forms occur only where occasional monadnocks were left standing above the level of the highest platform, otherwise the highest level is only slightly fretted by cirques and only gives an Alpine appearance from below. Most of the old *plauri*, a Romanian word meaning "paths," are on the middle and lower peneplane surfaces. The real Vulcan Pass is not the wild gorge of the River Jiu, but is one of the *plauri* frequented by shepherds and used at least as far back as Roman times, though the modern route is carried along the gorge of the river. There is much pasture on the platforms of the middle and lower levels and this is utilised by sheep during the summer months. Before the coming of winter, during which season the mountains are under heavy snow, the sheep are driven down to the lowlands.

De Martonne considers that the Eastern Carpathians correspond mainly to the third or lowest peneplane surface, with monadnocks of the second, and only fragments of the highest level in the Rodna Mountains. The amount of peneplanation of the rest of the Carpathians has not been worked out in detail except in the case of the Bihor massif which bounds the Transylvanian basin on its western side, and here de Martonne recognises similar stages of peneplanation and rejuvenation to those of the Transylvanian Alps.

The Southern Carpathians become lower towards the south-west and change to a north-south direction under the name of the Banat Mountains. Some geographers consider the Banat Mountains to begin west of the River Jiu, but it seems better to reserve the name for the

mountains west of the River Temes where the height is less and the structure different. Here sedimentary rocks of Palæozoic and Secondary age appear as well as the crystalline. In the Banat Mountains occur deposits of coal (Anina basin), and iron (near Moravița), which have given rise to a small but relatively important metal industry carried on at Recița.

The Bihor massif and its neighbouring mountains, which are known as the Apusenî (*i.e.* "western") Mountains in Romania, almost shut off the Transylvanian basin on its western side from the lower-lying Hungarian basin, without, however, preventing the rivers of the Transylvanian basin from finding their way westward to join the Tisza in the Hungarian plain. These massifs consist of very varied material and they are of somewhat doubtful tectonic origin, though considered by some writers to be connected with the ancient Rhodope system. They consist of ancient crystalline rocks, of Palæozoic and Secondary sediments of various kinds, together with recent volcanic material, the latter connected with small deposits of gold and silver. The whole mass has been greatly faulted and is much penetrated by faulted basins. With its meadow platforms and forested slopes its economic life is similar to that of the Transylvanian Alps.

The Transylvanian Basin.—This basin lies at a height of 1,500 to 2,000 feet above sea-level. It is composed of almost undisturbed sediments of Tertiary age such as underlie the recent deposits of the Hungarian basin. Owing to the continued sinking of the latter basin, most of the drainage of the Transylvanian basin goes westwards, and the relative height of the two basins causes erosion to be active in the higher one, so that the Tertiary sediments of the Transylvanian basin have been dissected to form a hilly country. The rounded summits of these hills separate broad valleys, which are often accompanied by softly outlined terraces. The clays and sandstones of this area rarely cause any sharp declivities but lend themselves to the development of smooth and gentle curves. Round the margin of the basin, particularly in the south and east, are a number of small flat-bottomed basins of special fertility, such as those of Sibiu (Ger., Hermannstadt) and Fagaraș, and those already mentioned, *i.e.* Brașov, Ciuc, and Gherghiu, though these are more properly inter-montane.

The peculiar manner in which the River Olt breaks through the lofty Transylvanian Alps is noteworthy.

This represents a beautiful example of river capture which took place when the land north of the mountains stood at a higher level than at present. The resultant gorge is known as the Red Tower Pass and is followed by a railway.

The climate of the Transylvanian basin is markedly Continental, with hot summers and cold winters, but is not so extreme as that of the Hungarian basin, and it also enjoys a heavier rainfall, owing to the greater altitude. The area was originally a wooded country and not a grass-land. Owing to the combination of favourable soil and climate most of the region has been cleared for cultivation, with maize and wheat as the leading cereals, with some orchard land and many vineyards. A good deal of pasture land is also to be found, so that the area is one of mixed farming. It was particularly favourable to early man, as it offered a great variety of resources in a small area, and defensive sites in addition.

Considerable mineral deposits are to be found. Salt on the eastern border, natural gas in the interior, and some lignite on the southern border. Small deposits of gold have long been worked in the surrounding volcanic mountains, but the industry is now at a standstill.

The larger towns of the basin are situated mainly on the western gaps or in the small surrounding basins at the northern end of routes over the Transylvanian Alps. Cluj (Mag, Kolozsvár; Ger, Klausenburg; 97,000) is the largest town, mainly inhabited by Magyars, and is well placed in regard to communications over the whole of the basin and with the Hungarian plain.

The mountain rampart enabled Transylvania to withstand the Turks, so that for long it was the most eastern outpost of West-European civilisation. The natural beauty of Transylvania, its mediæval towns, its picturesque inhabitants and its unspoiled countryside combine to present a scene of strange enchantment.

REFERENCES

Bau und Bild der Karpaten, by B. Uhlirg (Vienna and Leipzig, 1903), is the standard work, now somewhat out of date. See also "The Carpathians," by E. de Martonne (*Geog. Rev.*, Vol. 3, 1917) and relevant chapters in *Landeskunde der Sudeten und West-Karpatenländer*, by F. Machatschek (Stuttgart, 1927).

CHAPTER XXIX

THE ROMANIAN LOWLANDS

(1) **The Moldavian and Bessarabian Platforms.**—From the foreland of the Eastern or Moldavian Carpathians begins the great "Russian" platform, stretching away towards the east in Moldavia and Bessarabia. Tertiary material overlies the Palæozoic and Archæan floor, which is revealed in the upper valley of the Dniester. The rivers Seret (Rom, Siret), Prut, and Dniester flow in valleys about 600 feet deep in their middle courses and form convenient boundaries, the Prut between Moldavia and Bessarabia and the Dniester between the latter and the U.S.S.R., but they offer considerable obstacles to movement in an east-west direction. Their tributaries also aid both in dissecting the platform and in forming obstacles to movement, especially about latitude 47° N., where a broad anticline crosses the middle of both provinces from west to east, producing a hilly country which looks almost mountainous when seen from the valleys. This swelling sinks somewhat towards the north and considerably towards the south, where in Moldavia the platform merges in the lower Danube plain, while in Bessarabia it reaches the lagoon-fringed Black Sea. The surface of the platform is covered with loess.

The climate is markedly Continental, with hot summers and cold, snowy winters and a low rainfall which falls chiefly in summer. Both climate and soil are unfavourable to trees, and only the middle hill country carries any considerable tree growth, mainly of beech and oak. Elsewhere the natural vegetation is grass, though at the present day the mass of the area is cultivated. Cereals, especially wheat and maize, are grown under excellent conditions of soil, climate, and relief, and form the chief cash crops. Wine and tobacco are also exported from both provinces and a variety of other products are grown, mainly for home consumption. The vines here need special protection in winter (*see* p. 33).

One of the chief factors restricting trade in these two

provinces, especially in Bessarabia, is the paucity of transport. Good roads are naturally difficult to construct in a loss region devoid of stone for road-metal, and there are very few railways. The Prut is of minor importance for navigation owing to a multitude of meanders, but it is the only river utilised by steamers.

Not only structurally and climatically but also economically this platform belongs to eastern Europe. In population Moldavia is Romanian, though its capital, Iasi (103,000),¹ is largely Jewish. Bessarabia, on the other hand, has a very mixed population, especially in the south, owing to its political history. Depopulated by the Turkish wars, it was thrown open to settlers by Russia in the early nineteenth century, and though Romanians are in the majority there are considerable numbers of Ukrainians, Jews, Great Russians, Bulgars, and Germans. The chief town, Chisinau (conv., Kishinev), has a population of 117,000, but the only other town of any size is Cetatea Alba (conv., Akkerman), an indifferent port on a lagoon of the Black Sea. Apart from the two "capital" cities, urban life is undeveloped in both provinces, as in eastern Europe generally.

(2) **The Walachian Plain** — This region has much physical similarity to the Hungarian lowlands, but on the whole it is hotter and more arid, especially as compared with the northern part of the Alföld. In some ways it is more monotonous, as there are fewer trees and also fewer signs of habitation, and those with few exceptions poor and mean. Its Tertiary sediments are covered by a thick mantle of recent deposits derived from the wastage of the Transylvanian Alps. There is a top-dressing of loss, especially east of the River Olt, and considerable stretches of sand west of that river. The Walachian lowland is separated from the Bulgarian bank of the Danube not only by the main stream of that river, but by its flood plain, a band of swampy country, some six to nine miles wide, studded with lagoons and with deserted arms of the river. There are cliffs bordering the flood plain on either hand, and although those on the Bulgarian side are higher, rising some 300 feet above the swamps, and come closer to the river, those on the left bank remind us that the Romanian plain is structurally just as much a plateau as the Bulgarian "platform," though it is lower and covered by younger deposits. Indeed, the two regions

¹ Population figures are from the 1930 Census.

of the Walachian plain and the Bulgarian platform or foreland are not unlike each other in soil, climate, and products, but the Danube acts as a very real barrier between these two regions owing to the difficulty of building a bridge across the broad river and its broader swamps or of finding a landing-place for a ferry on the northern side. Only one bridge, that at Cernavoda, crosses the Danube in the 660 miles of the Romanian section, though there is a car ferry at Giurgiu.

From the cliff bordering the swamps and flood-plains of the Danube a series of broad terraces rise by very gentle stages until the foot-hills are reached, roughly at a height of 600 feet, and in turn the foot-hill zone rises until the mountains themselves are attained.



[Courtesy Royal Romanian Legation]

FIG 89 —PRIMITIVE METHODS OF HARVESTING IN THE ROMANIAN PLAIN

The rivers have mainly incised their beds, and though even those from the mountains contain little water in summer and those from the foothills mainly dry up completely, yet the valleys are cut down sufficiently near the water table for water to be procurable at no great depth, and in the deeper valleys springs occur along the sides. In August, and September, however, the water shortage is acute, even at such a town as Craiova, in spite of the fact that it is situated close by the river Jiu, one of Walachia's principal rivers and *before* the river crosses the plain.

Exposed to biting north-east winds in winter and blistering heat in summer, the treeless and waterless plain caused great hardship to the colonists who came from the foothills to people the plain in the nineteenth century.

Population is not dispersed here, but concentrated where water is available. In reality, the plain is more suited to large-scale than to peasant-farming, and in spite of the distribution of land among the peasants in accordance with the Agrarian reforms of 1917 and onwards, large holdings are still common here. They can be distinguished from the long, narrow strips of peasant cultivation by the big square fields, by the use of the tractors, and other machinery, or even from the fact that harrows and rollers are often drawn by a pair of fine large horses which would not look amiss in England, whereas the peasants use oxen for work in the fields, and their horses are mere ponies. Most of the wheat export of Romania comes from these plains and those beyond the Siret river, though the quantity is much reduced compared with pre-War days, as the peasants prefer to grow maize, a crop of which they have more knowledge and which forms their staple food. Communications across the plain are poor. Even the main trunk road which skirts the foothills is not macadamised, and its uneven surface makes motor travel painful. Other roads are dirt roads suited only to country carts. There is nothing here to compare with the fine new "international" road, which runs from Oradea through Transylvania to Bucharest.

In Oltenia, to the west of the River Olt, the land is higher, with rather more than half the region between the mountains and the Danube occupied by foot-hills which send long narrow fingers southwards, so that it is difficult to say where the foot-hill zone ends and the plain begins. The steppe-lands here are themselves less steppe-like, and have more variety of relief, a heavier rainfall, more numerous springs, and a more diversified agriculture.

The most favourable portion of the Walachian plain is that in which Bucharest was built. This region, known as the Vlăsia district, extends all the way from the foothills region near Ploieşti to the Danube, in the region where it is joined by the Argeş. Here are precisely those supplies of water and woodland which are generally lacking elsewhere on the plain. The two main rivers, Argeş and Dâmboviţa come from the high mountains and contain water even in summer, and though the Dâmboviţa where it runs through Bucharest is hardly more than an insignificant ditch and is now partly carried underground, yet this is not all the water which it has brought from the mountains, for it sends off several laterals or distri-

butaries higher up. It seems that the erosion gradient in this region is less now than formerly ; in any case the water table is near the surface, and it is noteworthy that the little river Mostitea east of Bucharest rises right in the middle of the plain. Nor have the rivers incised their beds to any extent, the Dâmbovită, Colentina, and Mostitea being all nearly level with the plain. The fact that the water table is near the surface means that trees will grow easily and considerable patches of natural woodland still remain. In addition to these local advantages the region also had the advantage of lying on the overland route between Constantinople and Transylvania, *via* the Bran Pass at the head of the Dâmbovită and the old Danube crossing at Giurgiu. Along this route was an active exchange of goods between the Orient and Central Europe. The actual site of the city was perhaps fixed by the presence of two small steep hills, on one of which now stands the Metropolitan Church and the Parliament House. The town came to be the princely residence from 1460 onwards and flourished as a market place. In 1640 it already had a population of 100,000, but the numbers declined and did not again reach this figure for nearly two hundred years, its growth being hindered by plunderings, burnings, and epidemics. The end of the eighteenth century saw an oriental-looking town with an extraordinarily cosmopolitan population : Greek, Armenian, Albanian, Bulgarian, Italian, Hungarian, German, Turkish, Jewish, in addition to the Romanian element. A new era began after the Russo-Turkish wars at the end of the eighteenth century, and the city grew with the expansion of the state. With only 121,000 inhabitants in 1860, by 1912 it numbered 341,000, and at the present day some 800,000. The city had lost its oriental character by the beginning of the present century, but the greatest changes in its appearance have taken place since 1918. Rebuilding is still in progress on every hand, and the city gives not only an impression of bustling life such as one might expect from a capital city, but also of beauty, orderliness, grace and cleanliness, which is perhaps unexpected in view of what one is accustomed to read in books written before, say, 1920. The administrative, commercial and cultural interests of Romania are all concentrated, perhaps over-concentrated, in Bucharest. There are also a number of industries such as floor-milling, brewing, brick-making, machine

repairing, and some machine manufacturing, but manufactures are not greatly developed.

Apart from Bucharest there are no towns in the midst of the plain. All the others are on the margins, either near the foot-hills or along the Danube.

The position of the two chief Danubian ports, Galatz (101,000) and Braila (68,000), strikes the eye as curious, in that they are only nine miles apart. Actually they were originally rival ports, the first being in the principality of Moldavia and the latter in the principality of Walachia before the union of the two in 1859. Each stands on a piece of firm ground that approaches the river on the northern side, but both are losing trade to Constanța (58,000) on the Black Sea coast.

The population of the Walachian plain is entirely Romanian and was settled from the foot-hills of the north, mainly in the nineteenth century.

The Romanian Foot-hills.—These form a fairly narrow band of country in Moldavia and also in Walachia as far west as the Dâmbovița¹ district. The folded Tertiaries of which they are composed contain important deposits of petroleum in the Prahova and the Dâmbovița districts. Large deposits of salt are worked near Slanic and less important amounts of salt and petroleum in the Bacau district of Moldavia. West of the Dâmbovița, a region of rather similar aspect but of different structure stretches out in front of the Carpathians, and is separated from them by the sub-Carpathian tectonic depression. In these western foot-hills the deposits were laid down as an outwash plain in front of the mountains, were raised bodily with the last elevation of the Carpathians, and have been since much dissected, so that deep valleys are sunk some 300 to 700 feet in the almost horizontal strata. The whole of the region of the foot-hills is a land of ancient settlements, smiling villages, old monasteries, and a fairly dense population with an active subsistence agriculture. Forested or wooded uplands usually separate the valleys from each other. Small holdings and a great diversity of crops are the rule. Fruit trees, especially plums, are abundant and the vine is widely grown. The population is more widely dispersed than in the plain. The most favoured zone of the foot-hills is the sub-Carpathian depression, which may be regarded as the cradle of Romanian nationality. At the outer edge of the foot-

¹ Pronounced *Dimbovitza*

hills, standing on the plain are a number of market towns, of which Craiova (63,000), Slatina, Ploești (77,000), and Buzau are the most important. Ploești is also the centre of the oil-refining industry. The output of petroleum in 1937 was 7.1 million tons, against 1.9 million tons in 1913. It is sixteen times as great as that of Poland, but represents only about 4 per cent of the world's total output.

The Dobruja.—Romania's trans-Danubian province is a treeless peneplane, whose löss-covered surface conceals a layer of unfolded chalk. This again conceals folded rock of an earlier age, except in the higher lands of the north, where the old folded strata appear at the surface. Owing to the chalk formation underlying the löss the region is particularly lacking in surface streams, but it is seamed by *wadis*, especially in the middle portion where the arid plateau looks like a slice of Africa. The Dobruja (Rom., Dobrojea) falls abruptly both to the Black Sea coast and to the Danube. It undoubtedly accounts for the northward bend of the Danube, which once more turns east at Galatz when freed from this natural embankment. The greater part of the Dobruja is still used only for pasture, but in the wetter south considerable areas have been under cultivation for some time and the land under the plough is increasing. The only town of any size is Constanța, though a number of charming seaside resorts have lately been developed here, *e.g.* Mamaia, and in the south along the so-called "Silver Coast" the little fishing port of Balçic, below gleaming white limestone cliffs, offers some possibilities of development as a harbour, though at present it is chiefly noted as a tourist resort which lies far enough south to escape the silt swept southwards from the delta of the Danube. The modern port of Constanța is artificial, but is of great and growing importance to Romania, as it is practically ice-free. It is connected by a pipe-line with Ploești.

The population of the Dobruja is very diverse. The number of Romanians is increasing, but Tatars, Bulgars, and Russians are numerous.

Romania.—The state of Romania has grown in a remarkable fashion since 1859. In that year the two Romanian-speaking principalities of Walachia and Moldavia united, and from that year dates the beginning of the westernisation of the country. Up to that time the country had been under Byzantine, Turkish and Russian influences, and the whole region was in an extremely backward condition. The first bank was only founded in 1857

and was a failure, and the first railway was not opened until 1869. The combined principalities attained the rank of kingdom in 1881. About the same time Bessarabia was ceded to Russia, but the bulk of the Dobruja was gained. The southern section of the Dobruja was ceded by Bulgaria after the second Balkan War, in 1913, and the rest of the Romanian territories at the end of the Great War. The addition of Transylvania, the eastern section of the Hungarian plain, Bukovina, and Bessarabia doubled the area of Romania and almost doubled the population, though rendering it less homogeneous. Of the 18 million inhabitants, some 1½ millions are Magyars together with Székelys, 1.1 millions are Ukrainians, 757,000 are Jews, and 400,000 are Germans.

The Romanians claim to be descended from the colonists and Romanised inhabitants of the Roman province of Dacia and repudiate Slavonic association, though undoubtedly there has been considerable intermixture with the Slavonic-speaking peoples. The language has a Latin basis and the country looks to the Romance-speaking peoples for support and guidance, though by religion the people belong to the Greek Orthodox Church.

The country is overwhelmingly agricultural. Over 80 per cent of the people live on farms. Since the agricultural reform laws of 1917 large estates have been broken up to satisfy the land hunger on the part of the peasants, and the amount of agricultural produce available for export has somewhat decreased. There is little industrial development owing to the shortage of coal and iron, to historical backwardness, and to lack of capital, so that the country depends on its agricultural exports for its ability to import the necessary manufactured goods. The leading exports are petroleum, cereals and timber. Wheat is the principal cereal exported, since maize is the staple food for home consumption. Romania may be looked upon as one of the granaries of Europe.

REFERENCES

La Valachie, by E. de Martonne (Paris, 1902), is still the classic monograph on this region. Among the many books on the economic geography of Romania the following may be noted: *La Roumanie Economique de 1860 à 1915*, by G. D. Cioriceanu (Paris, 1928), and *Les Grands Ports de Roumanie* (Paris, 1928), by the same author. The *Atlas de l'Agriculture en Roumanie* (Bucharest, 1929) is worth consulting. For the human geography, *Eastern Carpathian Studies*, edited by H. J. Fluere, and R. A. Pelham (London, 1936), and *Romanian Furrow*, a travel book by D. J. Hall (London, 1933), contain interesting material.

CHAPTER XXX

THE DINARIC SYSTEM

THIS system extends from the Ljubljana (Ger., Laibach) basin on the north to the southern tip of the Greek mainland. It is widest in the north between the Gulf of Fiume and the Drin Gulf, where also the distinctive feature of the Karst is widely developed. This high Karst desert offers and has always offered a great barrier to communication between the excellent harbours of the Dalmatian coast and the fruitful lands of Bosnia and Serbia.

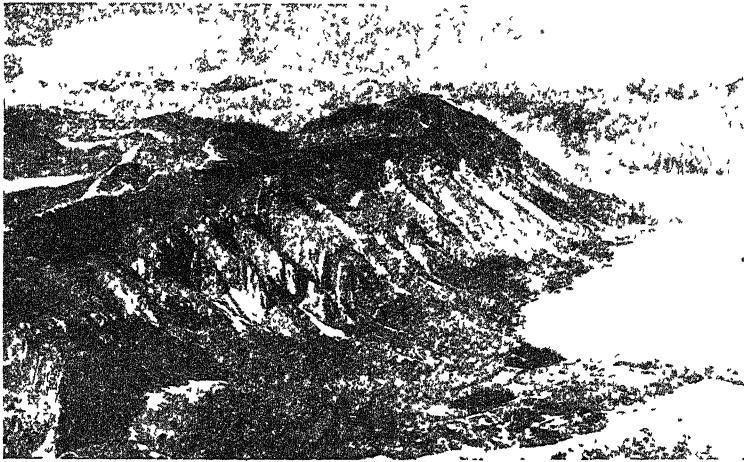
Between the Drin Gulf and Cape Glossa the direction of the coastline changes from north-west—south-east to north-south, without, however, any general alteration in the north-west—south-east direction of the mountain chain. In this Albanian section the mountains are fronted seaward by malarial lowlands poor in harbours. This, together with the lawless, uncivilised character of the Albanian people, has also served to render entry into the South-Eastern peninsula difficult from the Adriatic side. From Cape Glossa southwards the coast resumes its north-west to south-east direction, concordant with the mountains, which here form the backbone of the Greek peninsula (*see* Chapter VIII). It will be seen, therefore, that the South-Eastern peninsula turns its back, as it were, on the Adriatic and Italy, though it is open to the north, to the east, and to the south-east.

The system generally resembles the Dinarides of the eastern Alps, though the nappes here are recumbent towards the south-west.

The Northern (Yugoslavian) Section of the Dinaric System.—Along the drowned concordant coast occur strata of Cretaceous and Eocene age, in which strips of limestone usually form the islands and ridges, and strips of Flysch are found alternating in the depressions. Many of these depressions have been invaded by arms of the sea, giving rise to the so-called "L" and "T" gulfs and numerous islands which characterise the coast. The climate may be called Mediterranean in type, with dry summers and usually brilliant skies, but the annual

rainfall is very heavy, Dubrovnik (Ragusa) on the coast having 59 inches.

On the limited amount of lowland, provided the soil is suitable, Mediterranean crops such as olives and figs are grown, though on the limestones even of the coastal belt only meagre pasture is to be found. Italian influences, *e.g.* in the type of house, are ubiquitous and a considerable number of Italian-speaking people are to be found in the towns, but the great bulk of the population is of Slavonic speech, though they have adopted a Mediterranean mode of life and are largely occupied with horticulture and



[Courtesy Yugoslavia Express Agency, Ltd]

FIG 90 —VIEW OVER THE GULF OF KOTOR (CATTARO), DALMATIAN COAST.

Note the cultivation terraces on the lower slopes.

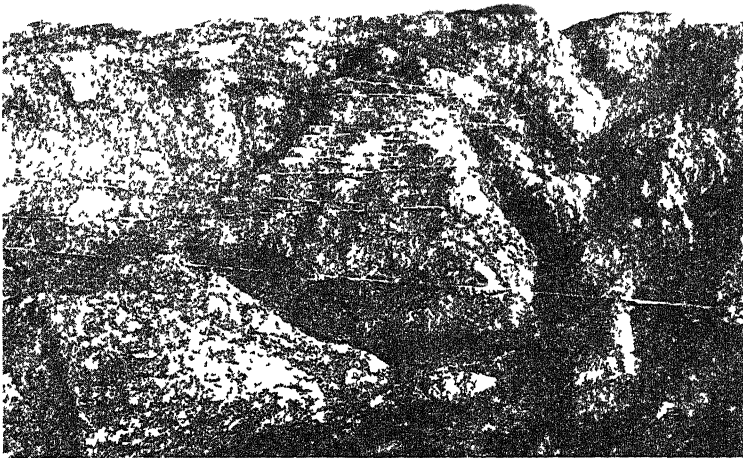
fishing. The inhabitants of the coastal strip were renowned during the Middle Ages and in the period immediately afterwards for their seafaring prowess, and at various times were also notorious for piracy. The old Dalmatian republic shared in the Mediterranean carrying trade and forwarded goods into the interior of the peninsula, mainly *via* the Neretva valley.

The Karst Zone.—This limestone zone rises abruptly from the narrow coastlands in a belt of country about fifty miles wide and with a maximum height of over 8,000 feet, though it is not so much the height or the breadth which makes it such a barrier as its barren, waterless character.

Although a folded mountain system, yet the region was roughly peneplaned and now presents three main plateau levels, which are successively higher as one goes inland and from whose surfaces mountain chains rise up. The limestone of which the whole region is composed is singularly porous, so that there is a general absence of surface water. This is not owing to any lack of rainfall, on the contrary, the rainfall is one of the heaviest in Europe, reaching over 180 inches in places. This precipitation, however, disappears underground and forms a vast network of subterranean drainage which is useless to the inhabitants of the region, who are obliged to procure their water supply by storing rainwater in reservoirs and cisterns. Only one river, the Neretva, traverses this zone above ground, and this only maintains itself because it has been powerful enough to cut a deep cañon which reaches below the water table and so is fed from subterranean springs at the sides of the gorge (*cf* the Tarn gorge in the Causses of France). The spring-fed water of the Neretva is so cold that it has to be warmed by the sun in reservoirs before it can be used for irrigation along its lower course. The scanty vegetation of the Karst can support only a few sheep and goats, apart from the occasional depressions where a little soil has accumulated and where cultivation can accordingly be carried on. These depressions fall into two classes, the *polja* (sing., *polje*, a Serbian word meaning "field"), which are large depressions running parallel to the strike of the rock, and *dolina* (sing., *doline*), which are small round depressions formed by the solution of the limestone and floored with a residual soil of a bright red colour. To these may be added the lowlands of the lower Neretva valley. The *polja* unfortunately are inundated in autumn and spring, which are the rainiest seasons, and therefore are useless for perennial culture such as trees, or for crops which need a long growing season. They are therefore devoted almost entirely to cereals, maize in the lower *polja*, *e.g.* Popovo, and wheat in the higher. Unduly prolonged inundation causes famine. In the *dolina* varied crops are grown, particularly tobacco, and at lower altitudes vines and figs.

Except in the cultivated regions mentioned above, the population is exceedingly scanty and is mainly transhumant. Owing to the marked summer drought all lower Hercegovina has a burnt-up aspect in summer, so

that the sheep and goats are taken up to the high mountains for pasture. The barrenness of this region makes railway construction uneconomic, especially in view of the expense of such construction in a land devoid of a normal river system. The land falls seaward so abruptly that the gradients have so far only been surmounted by three railway lines, running from Fiume, Split, and Dubrovnik respectively, and all presented great difficulties in construction, that from Dubrovnik being a cogwheel railway for part of the distance. It used to be thought that deforestation had much accentuated the loss of soil and



[Courtesy Yugoslavia Express Agency, Ltd

FIG 91 —ZIGZAGS ON THE LOVCEN PASS, WESTERN MONTENEGRO

The hairpin bends on this new road rival those of the great Alpine passes. The barren nature of the karstic limestone is apparent.

the consequent waterlessness of the Karst. But as prehistoric tumuli and Roman roads have been found to be constructed in the limestone, the forests, if any, must have disappeared a very long time ago. In any case, the Karst probably presented the same appearance in the Middle Ages as it does to-day, for in the thirteenth and fourteenth centuries Dubrovnik (Ragusa) was importing timber.

The Karst belt is followed eastwards by, or is usually said to include, a long belt of mountainous country which consists of impermeable Palæozoic material with a normal river system, rounded forms, and considerable forest cover.

The highest portion lies to the north-west of the Sarajevo basin and is sometimes known as the Bosnian Ore Mountains. The mountain of Kucki Kom in eastern Montenegro also belongs to this belt. To the east of this zone lies another but narrower belt of limestone with Karstic characteristics, but this is quickly succeeded by impermeable rocks of various kinds upon which grow the vast forests which cover the greater part of Bosnia.

To the south, the Karst belt widens greatly north-east of Lake Scutari to form the North Albanian Alps, also known as the Prokletije Mountains, whose summits,



[Courtesy Yugoslavia Express Agency, Ltd

FIG 92 —MOSTAR, BOSNIA

The minarets recall the long Turkish occupation of the Balkan Peninsula

reaching over 7,000 feet, were carved into Alpine forms as a result of the Quaternary glaciation.

Immediately south of the North Albanian Alps, the Karst belt plunges under other nappes which were thrust over it from the east. There is no "Karst belt" therefore in Albania and Greece, though limestones are by no means absent.

Albania.—This mountainous little country is unique in the Dinaric lands in not having a concordant coast. Although the direction of the coastline changes from north-west—south-east to north-south, the direction of the ranges is generally constant, and a triangular-shaped

lowland, seamed with lines of low hills, is developed on the Flysch and Tertiaries of the coastal zone. This lowland has its base along the Adriatic coast from the Drin Gulf to Cape Glossa, and its apex near Elbasan. The coastline alternates between low headlands and swampy depressions and there is no good harbour, though Durazzo (Alb., Durrës) was well known in Roman times. The depressions of this lowland are swampy and malarial, and the limestone hills covered with maquis which give pasture only to sheep and goats, so that there are few opportunities for agriculture. The climate is Mediterranean.

Apart from Tirana (31,000), the capital, the settlements of any size lie along the foot of the mountains or just within them. A new road, following the line of the old Via Egnatia goes *via* Durrës and Elbasan to Lake Okhrida.

The southern section of Albania, sometimes known as Albanian Epirus, begins with Cape Glossa and runs concordant with the coast. Lofty mountain ranges, running north-west to south-east, alternate with deep river valleys, along which Greek influences have penetrated from Greek Epirus, and the inhabitants of the southern valleys, Viosa, Dhrino, Osum, are Greek in culture and religion. Pastoral life prevails as on the southern side of the frontier. Where these ranges run out to sea the excellent harbour of Valona is developed in an intermontane depression. The entrances of this harbour are controlled by Italy.

The high mountain zone of interior Albania stretches southwards from the River Drin to the southern end of Lake Prespa. There are four, and in places five, more

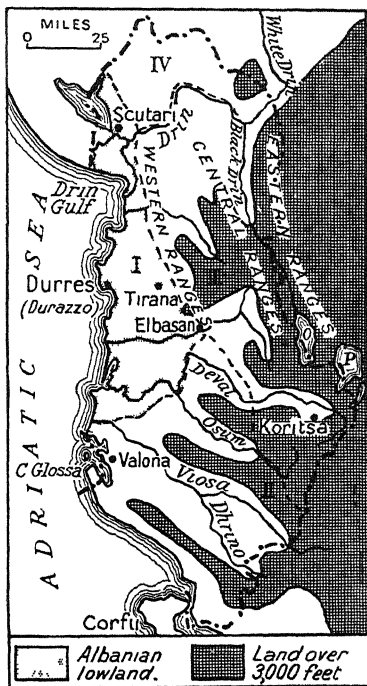


FIG 93—ALBANIA GEOGRAPHICAL REGIONS

or less parallel zones. The outer or western mountain zone consists of bare ranges through which rivers flow in difficult gorges to the lowlands. There is an inner tectonic depression, occupied by the upper courses of various rivers and filled by young sediments, which offers facilities for agriculture. This discontinuous depression is succeeded eastwards by the lofty central zone, where there is much forest, though it has been partially cleared. The range is very difficult to cross, except in the north and south, and offers a great barrier between the western longitudinal furrow and the next depression. The latter is occupied by the Black Drin, Lake Okhrida, and the Koritsa (Alb., Korce) basin, but is divided up into compartments and is not so traversable as might appear from a small-scale map. Part of this furrow is in Yugoslavia. A fifth zone comprising the third band of mountains lies mainly in Yugoslavia, except in the north. (See Fig. 93.)

These zones are separated by the River Drin from the North Albanian Alps (mainly in Yugoslavia), which present the only conspicuous exception to the normal north-west to south-east direction to the western Dinaric ranges. The River Drin takes advantage of a bay in the coastal Tertiaries and of the absence of the Karst belt to develop a transverse valley, and river capture has enabled it to tap the Metoja basin by means of its tributary, the White Drin.

The full explanation of the backwardness of the Albanian people is a long story, and when all has been said the fact remains somewhat puzzling. The extreme division into tiny compartments of lowland separated from each other by lofty mountains was no doubt adverse to the advances that come through co-operation and knowledge of other peoples. Also many of the Albanians embraced Islam at the time of the Turkish conquests, and so cut themselves off still more from western Europe. A patriarchal organisation of society still prevails and blood feuds are rife. The exports are almost negligible and consist mainly of cheese, animals, and eggs.

Albania was in reality an appendage of Italy, even before the "conquest" on Good Friday, 1939. This tiny land of 11,000 square miles and a million souls is looked upon by Italy as a gate of entry into the South-Eastern peninsula. By lending large sums of money which were to be spent under Italian supervision, by arming

and officering the army, by building new roads and railways, Italy had already obtained control of the country for all practical purposes.

The Southern Drainage Slope of the Sava.—The right-bank tributaries of the Sava, namely, the Kulpa, Una, Vrbas, Bosna, and Drina, drain an area which was probably once completely forest-covered, though at the lower levels, particularly along the Flysch and young Tertiary hill country bordering the Sava, the forest has been cleared for cultivation. Large areas of timber, particularly beech and oak, remain in the higher regions, especially round the middle Drina, upper Bosna, and upper Vrbas, and logs are floated down the rivers. A fair amount of timber is also sent by rail to the Adriatic ports. Fifty per cent. of the province of Bosnia is estimated to be forest-covered, as against 31 per cent. for the whole of Yugoslavia.

The rocks forming this region are varied and the geology complicated, but in the main the strata consist of Palæozoic shales and sandstones, Mesozoic limestones, together with bands of hornstone and serpentine. There is a normal above-ground river system, though cañons are often formed in traversing the limestone. The population lives in clearings in the forest, where population density is about twice as great as on the Karst. Besides forestry and charcoal-burning, subsistence agriculture is carried on, including the rearing of cattle and sheep. Population naturally increases towards the lower altitudes, and along the Sava borderlands agriculture is very important, especially the cultivation of maize, wheat, and the growing of orchard trees, which provide large numbers of prunes for the export trade. The region contains one considerable interior tectonic basin, that of Sarajevo, and a number of smaller ones. In the Tertiary deposits of the Sarajevo basin considerable deposits of lignite are found. Small iron deposits occur to the east of the basin, but more important deposits are found in north-west Bosnia at Ljubija near Prijedor.

Northern Serbia as far south as Užice and the Western Morava is similar in appearance and products to northern Bosnia. The Šumadia (=forest) region of Serbia has been almost entirely cleared and devoted to agriculture, only the higher southern part being now under timber. The Šumadia, which is roughly rectangular in shape, is bounded westwards by the Kolubara, northwards by the

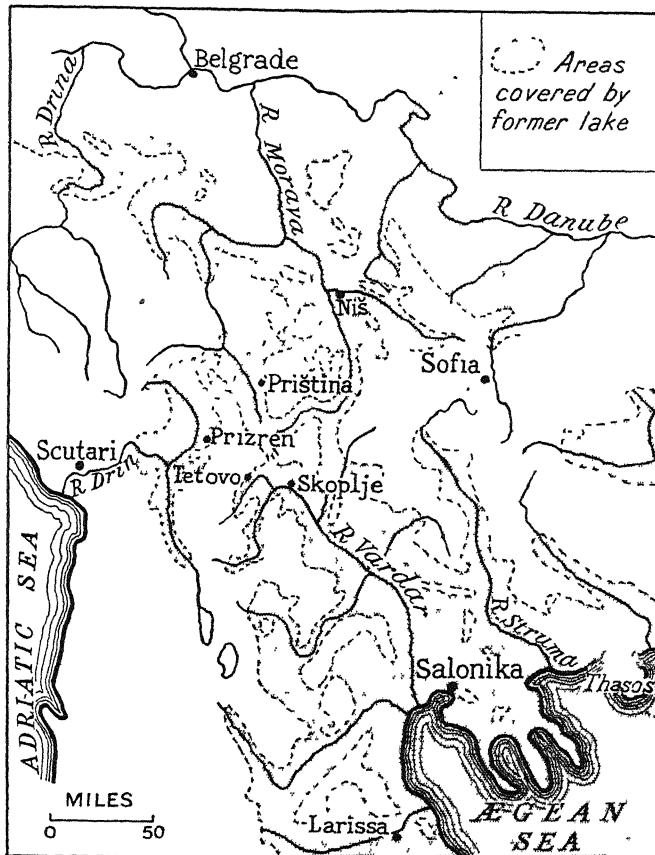
Sava drainage, eastwards by the Morava, and southwards by the Western Morava. It is covered mainly by Flysch and young Tertiary material, with a string of young volcanic intrusions extending almost as far north as Belgrade (Serb, Beograd), and it is underlaid by a core of ancient crystalline rocks, part of the Rhodope mass, which appear at the surface in the south-eastern corner. It was from this region that the main Serbian resistance to the Turks was organised at the beginning of the nineteenth century.

The Mountain-and-Basin Corridor Lands.—Between Belgrade on the north and Salonika in Greece on the south lies a stretch of rugged country, about 300 miles long from north to south and about 90 miles wide from east to west, which lies almost entirely on the crystalline rocks of the western Rhodope and of the northern Pelagonian masses, and which is threaded by a remarkable series of tectonic basins, mainly lying along the courses of the Morava, Ibar, Vardar, and Struma rivers. These basins are generally aligned with an axis from north-north-west to south-south-east and so give the shortest possible route through the South-Eastern peninsula from Central Europe to the highway of the Mediterranean Sea. Although this corridor area is often rugged, yet it is bounded in its middle and southern sections by land which is definitely higher, wilder, and more difficult to traverse, particularly in the High Rhodope on the east and the Dinaric ranges on the west. Only at one point does traffic seriously escape from the guiding lines of the corridor, namely, where the basins and gorges of the Nišava tributary of the Morava have been traversed by a railway leading to Sofia and so onwards to Constantinople and the "land" route to Asia *via* the Bosphorus.

The "corridor lands" lie mainly in Yugoslavia. Here there is a double line of movement; an easterly route which was formerly used by a Roman road following the River Morava and the lower Vardar; and a westerly one which was used by the mediæval "Carski Put" or Imperial Way, going *via* the River Ibar and the Kosovo *polje* and joining the first route in the neighbourhood of Skoplje. Both are now followed by a railway, the more easterly route carrying the main line. A possible continuation of the western route lies southward of Skoplje through the Pelagonian basins.

The Struma valley (Bulgarian) is a less important thoroughfare than the Morava-Vardar system, as it affords

a less direct line of communication between Central Europe and the Mediterranean, but a railway links Sofia to the Ægean coastlands *via* this route. As already mentioned in the introduction to the section on South-



[After Couvê]

FIG 94—THE ÆGEAN LAKE OF THE LATE TERTIARY AND EARLY QUATERNARY PERIODS IN YUGOSLAVIA AND ADJACENT REGIONS.

Central Europe, these basins were formed in mid-Tertiary times, when dislocations led to segments of the Rhodope-Pelagonian mass rising and sinking like the slabs of a badly laid pavement. The down-faulted areas became filled by branches of the fresh-water Ægean lake, which shrank intermittently, so that all the basins have

bordering terraces more or less dissected by sub-aerial erosion, while the middle portions tend to be flat. The gorges connecting the basins are usually cut in the sediments deposited in narrows or straits of the former branching lake system, though sometimes they reach to the solid rock.

The gorges naturally offer difficulties to road and railway construction, and neither the Vardar-Morava nor the Vardar-Ibar routes can be said to be particularly easy, though there is no high watershed to be crossed in either case. The water-parting between the Vardar and Ibar is indefinite, feeders of both rivers rising in the Kosovo *polje* and the water at the source having an indeterminate flow.

These basins offer opportunities for settlement and cultivation within a region of inhospitable mountains. The level floors tend to be marshy, as in the case of the Kosovo and Skoplje basins, but good grazing for cattle is provided where the marshes have been drained. Elsewhere the basins are under cultivation, maize being the typical cereal north of the Šar Planina and Cerna Gora, except in the high Kosovo basin, and wheat in the drier south, though both cereals are grown in both areas. The Skoplje basin, however, already has the rather dry summers that foreshadow the Mediterranean rainfall régime. Consequently, as in the other southern basins, irrigation has been practised to some extent since the Middle Ages, there being no lack of water from the surrounding high mountains. On the old lake terraces the vine is cultivated in all the basins, and fruit-trees such as apples, pears, and peaches flourish and are on the increase. Each basin of any size has its market town, *e.g.* Priština and Tetovo, some of the towns also having importance as nodal points, *e.g.* Niš (36,000) and Skoplje (65,000).

The surrounding mountains were peneplaned long before the basins were formed and mainly have rounded contours. They are well forested in the north, *e.g.* the Kopaonik Mountains, but those farther south, where the drier summers give less favourable conditions, have been largely cleared for sheep pastures, though there are quite large patches of forest round the monasteries and on northward-facing slopes. There are considerable numbers of Vlach shepherds, of Romanian affinities, as in the mountains of Macedonia and Greece. These are mainly

transhumant and have been accustomed to winter their flocks in the southern basins, though with the increase of cultivation the area available for winter pasture is shrinking.

The Kosovo *polje* and the Kopaonik Mountains immediately to the east of the River Ibar mark the western edge of the Rhodope mass. The Kopaonik Mountains consist of very varied material, but largely belong to the Serpentine zone of the Dinaric system, with intrusive Tertiaries betraying the fracturing of the border zone.

There are two possible ways of escape for traffic westward from the corridor lands to the Adriatic, though both were neglected until very recently. The most northerly is that *via* Prizren and the Metoja basin, and so *via* the White Drin to the Albanian coast. It was hoped to build a railway along this route. The second possible line of movement is from the Vardar *via* the Bitolj basin and Lake Prespa through Albania to Durazzo. Both routes are now followed by roads.

The Pelagonian basins, of which Bitolj is the largest, lie at an even higher level than that of Kosovo (Bitolj = 1,922 feet). They are connected north and south by rail with the Skoplje basin and the Ostrovo basin (in Greece) and thence to the delta of the Vardar, but the gorge by which the River Cerna drains the basins to the Vardar is not used. Lake Prespa marks the border of the Pelagonian mass on the west.

The mountain-and-basin corridor lands are bounded eastwards by the Balkan Mountains in the north and by the High Rhodope farther south. The Balkan Mountains in Yugoslavia are usually known under the title of the Mountains of North-East Serbia. They continue the same direction and character as the Banat Mountains on the other side of the Danube. The crystalline zone contains the mineralised region of Maidanpec, with copper and lead. The mountains are studded with a number of fertile tectonic basins, *e.g.* Zajecar on the Timok, Pirot and others on the Nišava, which are often linked to each other by gorges.

Yugoslavia.—The political unit of Yugoslavia has grown snowball fashion since 1821, when its Serbian nucleus, the Šumadija region, won its freedom from the Turks. The collapse of the Austro-Hungarian Empire enabled the Croats and Slovenes to join up with the Serbs, but the new state includes peoples in very diverse stages of

development, and as in the case of most of the new composite states the post-War history has not been without stormy passages. It was only about seventy or eighty years ago that the now well-cultivated lower Morava valley was under oak forests, whose acorns nourished large herds of pigs, as in Norman times in England. The people in the mountainous districts are still very primitive. On the other hand, the Slovene lands have shared in the higher standards of culture prevalent in Austria and the Croats also pride themselves on their more advanced ways.

The interest of the outside world in Yugoslavia has centred mainly on her command of the routes to the Ægean and the Bosphorus. In fact, its political geography has overshadowed all other aspects. It was to the advantage of the Central Powers to keep Serbia and Bulgaria weak, dependent states, in order to have no interference with their 'Dräng nach Osten' policy and with their scheme for a central Europe under German domination. Nor did victorious Italy in 1919 relish the idea of having a powerful neighbour on the other side of the Adriatic. Hence the annexation of Bosnia-Herzegovina by the Austro-Hungarian Empire and the bolstering-up of an independent Albania. Hence, also, Italy's claims on Fiume, Zara, and the Adriatic islands, to which some colour was lent by their historical associations and the presence of considerable numbers of Italians in Zara, Fiume, and Ragusa (Dubrovnik). The seizure of Albania has no such excuse.

Yugoslavia has now an area of 96,000 square miles, *i.e.* it is rather larger than Great Britain, and possesses a population of 14 millions, of whom about 83 per cent. are either Serbs, Croats, or Slovenes. Owing to the mountainous nature of much of the country, the population density is not high, but varies from 179 per square mile in the low Dunavska province, which includes the former regions of the Banat, Bačka, Voivodina, and the northern Šumadia, 168 in Dravska province, the former Slovenia, 163 in Savska province, the former Croatia, to 65 in Zetska province, the former Montenegro. The population is mainly rural, and, as in Romania, sweeping measures of agrarian reform were carried out at the end of the Great War in order to satisfy the land hunger of the peasants. At the same time feudal obligations, inherited from the Turkish régime were done away with. The addition of the grain-producing lowlands of the new provinces across

the Sava has greatly added to the agricultural wealth of the country. South of the Sava-Danube line forests and pasture occupy more land than cultivated crops.

The forested and agricultural nature of the whole country is well borne out in the export list. Timber comes easily first, followed by eggs, grain, pigs, raw copper, animals, hops, meat, cement, and prunes. The country, however, is in a rather better position than Hungary and probably than Romania for industrial development. Her deposits of iron ore, though unknown in detail, are thought to be large, and her brown coal supplies are larger than those of Romania, though worked to a less extent.

Of the cities Belgrade (Serb., Beograd) has grown very rapidly since the Great War, from 112,000 in 1921 to 241,000 in 1931, and has been largely rebuilt in western style. The heart of the town, whose name means "white castle," lies on a hill promontory overlooking the Sava, just to the west of its junction with the Danube. Both east and west of Belgrade the Danube and Sava have marshy banks as far as the Iron Gate on the east and the Drina on the west. Its position at the northern end of the corridor lands exposed it to frequent attack in the past, but is excellent from a commercial point of view. Since the accession to Yugoslavia of the southern part of the Hungarian plain, Belgrade is no longer situated on the extreme edge of the country.

Zagreb (186,000) is the second city of the country and an important banking and commercial centre. It manufactures alimentary produce, *e.g.* beer, flour, and also other commodities, especially textiles, paper and metals.

REFERENCES

On structure: *Geologie der zentralen Balkanhalbinsel mit einer Übersicht des Dinarischen Gebirgsbaues*, by F. Kossmat (Berlin, 1924), "L'Ancien Lac Egéen," by J. Cvijić (*Ann. de Géog.*, 1911), *Beiträge zur Geographie Serbiens und Rasciens*, by N. Krebs (Stuttgart, 1922), *Littoral et Îles Dinariques*, by B. Ž. Milojević (Belgrade, 1933). On the economic aspect "Economic Resources and Problems of Yugoslavia," by M. R. Shackleton (*Scott Geog. Mag.*, Nov., 1925). On the human aspect, see "Socio-Biological Studies in the Balkans," by Olive Lodge, in *Population*, Nov., 1934, Nov. 1935, and Dec. 1937. Also for Slovenia: *Slovene Studies*, edited by L. D. Stamp (London).

The topographic map series of Yugoslavia on the scale of 1 : 100,000 should be consulted.

CHAPTER XXXI

THE BULGARIAN LANDS, TURKEY-IN-EUROPE, MACEDONIA AND THRACE

THE Bulgarian lands border the middle corridor lands of the South-Eastern peninsula on the east and fall naturally into a number of roughly east-west parallel zones. On the north the Bulgarian Platform rises to the Balkan Mountains, which are succeeded in turn by a long line of depressions. These depressions are followed on the south by the Rhodope system, which lies at a high level in the west, almost disappears in the middle, and rises once again in the Istrandja Mountains of European Turkey.

The Bulgarian Platform.—This region has already been compared and contrasted with the Walachian plain. It consists of unfolded layers of Cretaceous chalk and sandstone with a strip of Tertiary material overlying them in the north, though the whole of the solid geology is concealed by a mantle of loess. The gently undulating surface of the Platform is cut into a number of segments by almost cañon-like valleys which traverse the region from south to north, thus rendering east-west movement difficult, in contrast to the general ease of movement on the Walachian plain. Apart from these valleys there is a marked absence of surface water and settlements are accordingly agglomerated round wells or in the narrow valleys. This treeless land naturally lends itself to the cultivation of cereals, of which there is a large surplus for export. The chief towns are Varna (70,000)¹ on the Black Sea coast, which is the main port for the whole country, and Ruschuk (49,000), the chief port on the Danube. The frontier between the Bulgarian Platform and the Dobruja was once marked by a belt of forest, known as the Deli Orman (=“bad forest”), but this has now practically vanished.

The Balkan Mountains.—The Bulgarian Platform rises gradually to the foot-hills of the Balkan Mountains and of their continuation, the Mountains of North-East Serbia. The term Balkan Mountains is usually restricted

¹ Population figures are from the 1934 Census

to those east of the Bulgaro-Yugoslav frontier, which reaches the Danube along the lower stretches of the River Timok, but both sections belong to the same system

The Balkan Mountains, as in the case of the Carpathian system generally, owe their present height to a new upward impetus which followed the peneplanation of the original folds. Considerable traces of this peneplanation still remain, especially in the eastern Balkans, east of the longitude of Sliven, where both the original folding and the subsequent re-elevation were not very great. The mountains rise gradually from the Bulgarian Platform, the transition zone being marked by a line of small towns on or near the rivers leading into the highlands, *e.g.* Kutlovica, Vraca, Dermanci, Trnovo, and Preslav. The northern ranges consist mainly of varied Cretaceous material with long bands of limestone forming ridges. These northern ranges are well forested. The passes are numerous and not difficult to mountain folk. Two lines of railway traverse the range, the most important going *via* the Isker valley to Sofia, and the other *via* the Šipka pass to Kazanlık in the Tunja basin.

The highest zone, mainly rising above the forest, is found near the south and consists mainly of Palæozoic shales interspersed with masses of granite. The eastern Balkans lack the Palæozoic and granitic material, but though lower are less easy to cross, partly on account of the dense tangle of forest growth, and partly owing to the paucity of transverse valleys. They run out to sea at Cape Eminé.

On the south the mountains fall rather abruptly to a series of basins. These begin in the west with that of Sofia and continue eastwards for almost the whole length of the chain, the longitudinal sections of the Striema and Tunja valleys being especially noteworthy. The Sofia basin is shut in on the south by a branch of the Balkan Mountains which leaves the main chain in Yugoslavia, south of the Pirot basin, and runs in a south-south-east direction to come up against the Rhodope mass. The basin of Sofia (Bulg., Sofiya) lies at a height of 1,800 feet and is surrounded on all sides by high mountains, yet is very accessible owing to the peculiarities of the river system in this section of the South-Eastern peninsula, and especially owing to the extraordinary course of the Isker. This river rises in the granitic Rila Dagħ, one of the highest parts of the Rhodope mass, traverses one of the many

mountain-girt basins of this Bulgaro-Yugoslav borderland (that of Samokov), and breaks through another ancient granitic massif to enter the basin of Sofia. Continuing in a northerly direction, it proceeds to break through the Balkan Mountains. Its course can be explained only on the grounds of its being an antecedent river. Three other river systems, the Nišava, Tunja, and Struma, radiate from this complex area of basins and mountains, and offer a number of routes leading up to the basin of Sofia. The small size of the basin has prevented the area from obtaining the full advantages of its position, whose nodality is unique in the whole of the South-Eastern peninsula.



[Courtesy Bulgarian Legation]

FIG 95 —SHEPHERDS IN THE BASIN OF SOFIA

It contains the capital city, however, whose population numbered 287,000 at the 1934 census. The eastern basins are shut in on the south by the Anti-Balkans, a zone of low, rounded mountains composed of crystalline schists with granitic masses and some young volcanic material. The fertile low-lying basins of the upper Striema and Tunja are particularly well sheltered and have been called the garden of Bulgaria. The rose gardens of the upper Tunja produce oil for the famous scent, "attar" of roses.

To the south of the Anti-Balkans lies a considerable stretch of lowland, occupied in the west by the upper Maritsa basin, one of the many old lake basins of the South-Eastern peninsula. Owing to the fertile alluvial

soil, hot summers, and abundance of water, it grows a variety of products, including maize, cotton, the vine, tobacco, rice, etc., partly under irrigation. The villages lie sheltered among walnut, sweet-chestnut, and cherry trees. It is inhabited mainly by Bulgarians, but only became part of that state in 1885. Philippopolis (Bulg., Plovdiv; 100,000) is fast losing its oriental character.

The High Rhodope.—Between the Struma and the Maritsa rivers the central portion of the Rhodope mass remains as a fairly continuous area of high land. The Perim Dag, Rila Dag, and neighbouring highlands present considerable areas over 6,000 feet high, and include what is considered to be the highest mountain in the South-Eastern peninsula, namely, Mussalla, 9,613 feet. The forested mountains generally present rounded slopes recalling the former peneplane character. The Perim and Rila highlands are residual masses rising above the general level of the dissected plateau, and were high enough to develop glaciers during the Quaternary Ice Age, with the result that cirques and moraines are numerous. The whole central area is very little known to the outside world. It contains no railway and hardly any roads.

Eastwards the High Rhodope sinks gradually to uplands composed of young volcanic rock (andesite), drained by the Arda tributary of the Maritsa, and these in turn merge into the hills through which the Maritsa and Tunja break their way just north of Adrianople (Turk., Edirne). These hills are formed of crystalline schists, and link the Rhodope mass to its outlying portion, the Istrandja Mountains, whose little-explored forested heights extend from the Bulgaro-Turkish frontier to the roots of the Constantinople peninsula.

The Bulgarian State and People.—This interesting country and people have been strangely neglected by English writers. The Bulgars came into their present home in the eighth century, having previously been neighbours of the Magyars in the lower Volga region. They evidently mingled with the Slavonic-speaking peoples whom they dispossessed and adopted the language of the conquered. Their traditions, however, have prevented them from throwing in their lot with the Yugoslavs.

It was not until 1908 that they finally secured their freedom from Turkish suzerainty, though Bulgaria north of the Balkan Mountains obtained its autonomy in 1878

and joined with Eastern Rumelia in 1885. In spite of its proximity to Constantinople, Bulgaria does not seem to have suffered so much from Turkish occupation as might be expected and the somewhat dour peasant farmers have shown tremendous powers of resistance and recovery. Larger than Hungary, but smaller than any of the other states of South-Central Europe, Bulgaria has a population of five and a half millions, who are almost entirely dependent upon agriculture and forestry. A quarter of the total area is under forests, but little timber is exported, the main exports being tobacco, from the Struma and Mesta valleys, followed by wheat and maize, eggs, rape seed, fleeces, silk cocoons, and rose oil. Industry is undeveloped, and the old hand-weaving for which the Bulgars were famous seems to be dying out.

The two sea ports of Bulgaria, Varna and Burgas (36,000), are both on the Black Sea, access to the Ægean having been blocked by Greece and Turkey.

TURKEY-IN-EUROPE

The basin of the River Ergene and the lower Maritsa, also known as the basin of Eastern Thrace, extends south-westwards from the Istrandja Mountains. It is filled with Tertiary sediments, which are covered in places with Quaternary gravels and more recent alluvium. It is very level in the middle, but is dissected into undulating country round the border. It is mainly a region of steppe, caused by its basin configuration, permeable soil, late-summer drought, and cold winter winds. The lower portions of the basin provide only pasture, though the higher regions, which have a heavier rainfall, are cultivated.

Climatically this area seems to combine the bad points of both the Central-European and Mediterranean régimes. The prevailing winds are northerly all the year round, though calms are very frequent. This means cold dry winters and dry hot summers, so that the winters are too cold for the Mediterranean crops and the summers too dry for those of Central Europe. In autumn and spring the region shares in the Mediterranean "former and latter" rains, but June to September inclusive are almost rainless months. In winter occasional cyclones passing from the Mediterranean to the Black Sea bring southerly winds and thaw, so depriving the ground of its protective snow cover. It is evident that the evils of this marginal

climatic position are enhanced by the basin shape, since the bordering Istrandja and Rhodope Mountains have much heavier rainfall and a consequent timber covering.

The basin is enclosed on the south by a line of bare hills composed of folded Cretaceous and Tertiary material with a core of ancient rock. These border the Gulf of Xeros and the Sea of Marmara, and form the boundary between the Thracian steppe and the narrow coastal fringe of Mediterranean climate. This range of young folds, known in its highest part as the Tekir Dag, is of doubtful tectonic affinity.

The Marmara Region and Constantinople (Istanbul).—

The Straits zone has possessed great international importance since the days of the struggle between the Greeks and the Trojans. The narrowness of the entrances to the Black Sea means that this piece of water can be controlled under modern conditions by a land power not possessing a single ship. The importance to Russia of this sea exit may be estimated by the analogy of imagining the only ice-free port of the U.S.A. to be New York and for that city to be held by Japan. The land route from Europe to Asia is, also of immense interest to the central states of Europe.

The Dardanelles and the Bosphorus are both drowned river valleys, though probably not parts of the same river, it now being thought that a watershed lay near Istanbul. The harbour of Istanbul, known as the Golden Horn, is a drowned tributary valley, in which shipping could lie out of reach of the strong current that streams through the Bosphorus from the Black Sea.

With the decay of the Ottoman Empire, Constantinople declined in importance, and the removal of the Turkish capital to Angora was another very serious blow. However, it seems likely that its mixed population, which is largely composed of Greeks, Jews, and Armenians, will make a bid to control Anatolian trade and commerce, especially since the Greeks have been driven out of Smyrna and the Anatolian coastlands. New industries are being started in the neighbourhood, *e.g.* soap, chemicals, machinery, iron-founding, cotton-spinning. Another interesting feature is the recent development of its University on modern lines, with an academic staff consisting largely of Jewish refugees from German Universities. The nodality of the site is too great for the city to be easily extinguished and the population still numbers

741,000, and so it is the second largest city of South-Central Europe, only being exceeded in numbers by Budapest

THE GREEK LANDS OF MACEDONIA AND WESTERN THRACE

As a result of the Second Balkan War and the Great War, Greece secured the coastlands round the head of the Ægean, thus cutting off Yugoslavia and Bulgaria from direct access to that sea. These lands are developed on the southern part of the Rhodope mass and the eastern part of the Pelagonian mass. They consist of deltas and faulted basins separated by mountain zones running out to sea. They have a Mediterranean climate, although the amount of tillable land is limited owing to the swampy, malarial nature of the lowlands. The foot-hills, however, are adapted to Mediterranean horticulture,* and this, together with the excellent position for controlling trade with the interior, attracted the Greeks from early times. The rest of the population is Slavonic-speaking, though whether their language is a dialect of Bulgarian or not is a matter that has been hotly debated in dozens of volumes. There are also numerous Jews, and before 1923 there were considerable numbers of Turks. The establishment here of large numbers of Greek settlers driven out of Turkey in 1923 has caused a great preponderance of Greek-speaking people. With the help of gifts of foreign money, the basins are being converted into excellent agricultural lands, growing many crops, but with tobacco as the most important export.

Salonika (Gk., Thessalonike; 237,000) is easily the largest town, owing to its favourable position at the southern end of the Morava-Vardar corridor lands. It stands to the east of the Vardar delta and its port is somewhat out of the way of the silt from that river. Kavalla (50,000) is the port of the fertile Drama-basin and similarly stands clear of deltaic silt.

REFERENCES

Hochbulgarien, (2 vols), by H. Wilhelmy, Vol I, 1935, Vol II Sofia, 1936 (Kiel), and *Mittelbulgarien*, by J. H. Gellert (Berlin, 1937) are among the best of the considerable number of scholarly works on Bulgaria, published at the instigation of Prof. A. Penck. *Bulgaria, Past and Present*, by G. C. Logio (Manchester, 1936), is popular in scope, but the author is thoroughly well acquainted with the country. See also, "La Bulgarie," by A. Demangeon (*Ann. de Géogr.*, Vol 29, 1920). "Tektonik der Balkan Halbinsel," by J. Cvijić (*Comptes Rendus*, IX, Congrès géol. internat. Vienna, 1904), deals mainly with the Bulgarian lands. *La Macédoine*, by J. Ancel (Paris, 1929), deal at length with the recent development of that area.

SECTION VI—EASTERN EUROPE

CHAPTER XXXII

RUSSIA

THIS region of eastern Europe embraces about half the total area of the whole continent. It stretches from about 43° N. to 70° N., that is, approximately from the latitude of the French Riviera to that to the North Cape within the Arctic Circle, a distance of some nineteen hundred miles, and from about 23° E. to 60° E., a distance of some fifteen hundred miles, equivalent to the distance between the west of Brittany and Constantinople.

This great region may be said to form a single morphological and relief unit, stretching from the Arctic Ocean in the north to the Black and Caspian Seas in the south, and from the Vistula on the west to the Ural Mountains on the east. As already indicated in Chapter I, it is built up of unfolded sediments dating from Palæozoic to recent times, the whole forming a slightly raised peneplane of undulating or level relief. It is possible to traverse the whole region from north to south and from east to west along the great slow-moving rivers and their linking canals and not rise above a height of 650 feet. It is thus easily the greatest stretch of lowland in Europe and, indeed, one of the greatest in the world.

Eastern Europe is markedly different from the rest of the continent in the absence of any mountains which divide up the region into compartments, or which act as frontiers to climatic, political, or any other types of division. With such an extension in latitude, however, there must obviously be differences in climate, vegetation, and products from north to south, and, in fact, the vegetation changes from the tundra of the north, to the forest of the centre, and to the prairies of the south, which merge finally into semi-desert in the south-east. Both the climatic and vegetation divisions merge into one another almost imperceptibly and there is an absence of the abrupt transitions and the sharp contrasts which are characteristic of western Europe. At the same time there is an absence

of the fragmentary character and mosaic-like distributions which necessitate such detailed studies for the rest of the continent. Eastern Europe is built on broad, simple lines, so that one can perhaps compare it to an Egyptian pyramid, which though massive is easily described on account of the simplicity of its design, whereas western Europe has the intricacy of a Gothic cathedral.

Politically almost the whole of eastern Europe is included within the frontiers of a single state, and its boundaries practically correspond to what used to be known as Russia-in-Europe. Owing to the formation after the Great War of the independent states of Poland, Estonia, Latvia, and Lithuania and the occupation of Bessarabia by Romania, a strip on the western side of the Russian Platform now lies outside Russia. On the eastern and south-eastern sides the internal boundaries of the new Russia, that is, of the Union of Socialist Soviet Republics, largely ignore the traditional division into Europe and Asia, a tendency which the old boundaries foreshadowed by taking the eastern boundary of one province right across the Ural Mountains and well into western Siberia. Both old and new boundaries emphasize the fact that the old division between Europe and Asia is here out of date. It never rested on any secure geographical base, for the lands of Russia east and west of the Ural Mountains possess the same type of relief and climate, have broad similarities of soil and vegetation, the same continental vastness and remoteness from useful seas, and owing to the colonisation of the past three hundred years they now have the same type of inhabitants. The continental features are naturally intensified as one goes east, but Russia-in-Europe more closely resembles western Siberia than it resembles central or western Europe. The Ural Mountains form only a low wall, easily crossed in many places, between two similar expanses of country. As they consist of folded strata, however, they form another morphological region from that of the Russian Platform, and from that point of view may be taken as a convenient boundary.

On the south-east the Caucasus Mountains similarly bring the Russian Platform to an end, and themselves belong morphologically to the young folded mountains of Eurasia, the Alpides, while the mountains of the Crimea also belong to the same system. There is some uncertainty again about the limits between Europe and Asia

on the south-east. The Manych depression and the Ural River used to be taken as the boundary, but again the

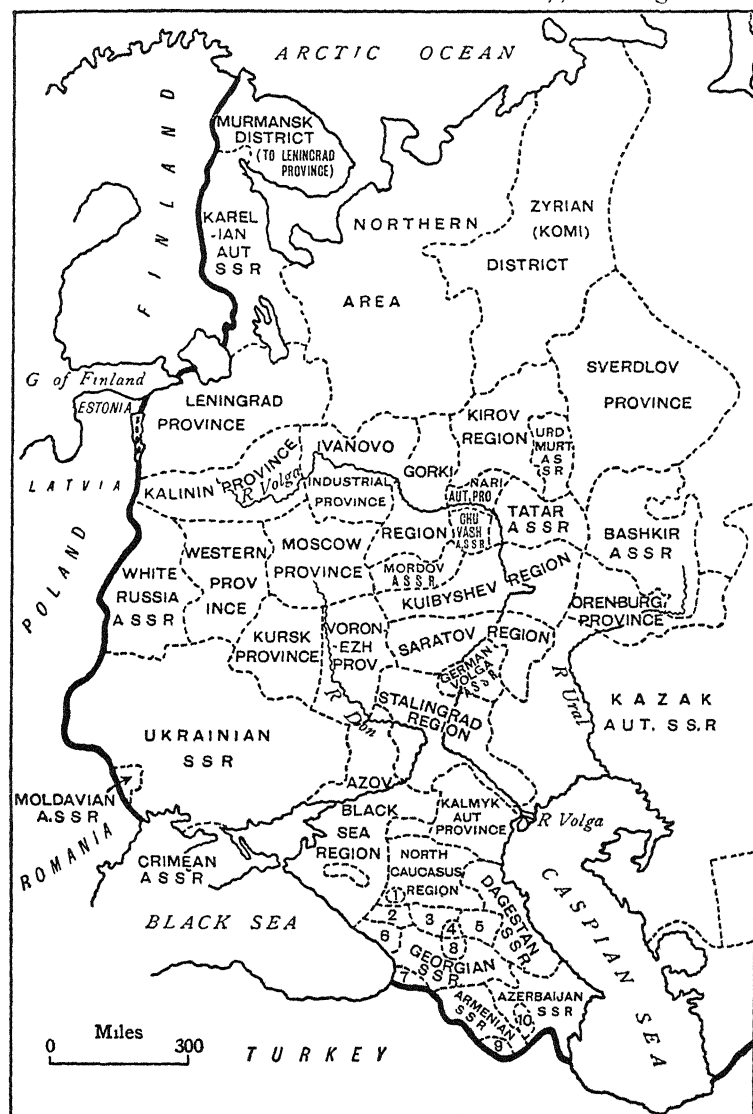


FIG 96—ADMINISTRATIVE DIVISIONS OF WESTERN RUSSIA

Autonomous Provinces of N Caucasus Region 1. Cherkess, 2. Karachay, 3. Karabakh, 4. North Osetian, 5. Chechen, 6. Abkhazian A.S.S.R., 7. Ajar A.S.S.R., 8. South Osetian A.S.S.R., 9. Transcaucasian S.F.S.R. includes 9. Nakhichevan A.S.S.R., 10. (Nagorno-Karabakh) A.S.S.R.

new internal divisions ignore these, and for the sake of convenience the boundaries adopted here will be the

Caucasus Mountains and a line joining the south end of the Ural Mountains to the Caspian Sea.

Structure, Relief, and Soils.—As already mentioned in Chapter I, the unfolded but slightly warped sediments of the Russian Platform were peneplaned in Tertiary times, so that the peneplane surface was developed over different geological formations ranging from Palæozoic to Tertiary. The peneplane was later slightly raised *en masse*, and the next episode in its history was the advance in Quaternary times of the ice-sheets from Scandinavia, which resulted in the masking of the solid geology by superficial deposits over the greater part of the platform. A mantle of glacial gravels, sands, and clays was deposited over the whole of the north-western half. South-east of these, loss was spread, probably by wind, over a broad strip (see Fig. 97), the deposits becoming less continuous and more patchy towards the south and east, while over the south-eastern corner of the platform during the Ice Age the Caspian Sea extended for more than 200 miles north of its present shores and deposited its sediments over some 144,000 square miles. Over the greater part of the Russian Platform, therefore, the nature of the underlying rock is of little importance. In a few regions, however, it affects the landscape, especially west of the Dnieper, where the old granite floor has pushed up near the surface and has been cut into by the rivers to give a landscape of considerable relief. The subsoil also becomes important when it bears productive minerals, as in the Tula coalfield south of Moscow and the Donets coalfield skirted by the river of that name which joins the lower course of the River Don, or the iron ore of Krivoi Rog in the Ukraine, 150 miles to the north-east of Odessa.

The nature of the soils in a country where the bare rock seldom shows through is of particular importance and has received a good deal of attention in Russia. In western Europe, where soils alter rapidly as one geological outcrop succeeds another, the possibility of a broad classification of soils was not very obvious. In Russia, however, where there is more uniformity, investigations revealed the fact that soils varied from one region to another rather as a response to conditions of climate and vegetation than to the geological outcrop. For instance, it was at one time assumed that the characteristic Black Earth (Russian *chernozium*) of the loss belt coincided with the limits of that belt, but it was revealed that the Black Earth con-

tinued on other rocks in patches where the loss was missing, and that in the northern part of the loss belt the soil was

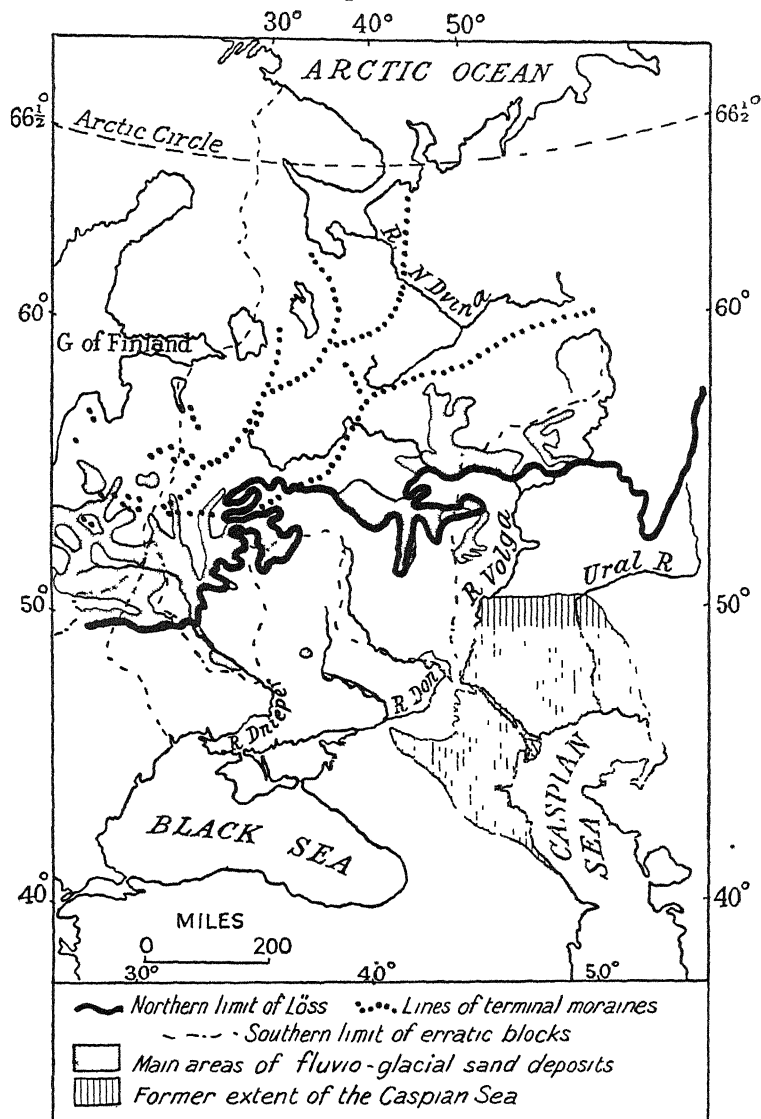


FIG 97—SOME GLACIAL FEATURES OF THE RUSSIAN PLAIN.

not Black Earth. The Black Earth soils are supposed to have resulted from the long occupation of this area by

steppe vegetation, which in itself was mainly a result of the climate. In the north of the loss zone, however, forest long ago encroached on the steppe and the Black Earth altered in character and assimilated to the ash-grey soils (Russian *podsols*) of the forest zone, which cover

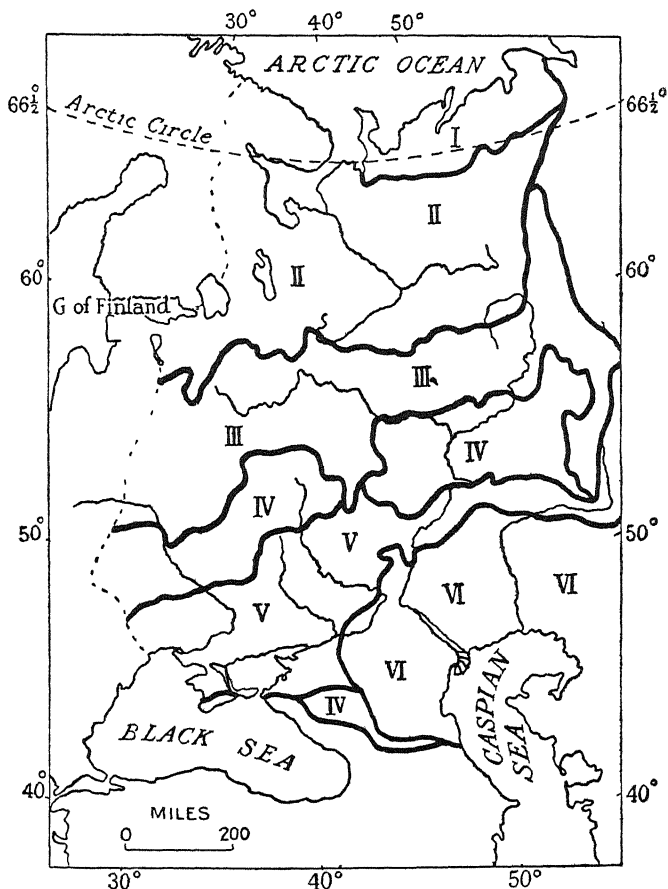


FIG 98—MAJOR SOIL ZONES OF EUROPEAN RUSSIA.

- I, Tundra and bog region, II, Podsol-swamp region, III, Podsolised forest region; IV, Podsolised chernozium, V, Chernozium, VI, Chestnut and brown soils

most of the northern part of Russia. In the extreme south of the country the red soils characteristic of the Mediterranean region appear, and in the south-east the chestnut and brown soils of the dry steppe or semi-desert zone. It must, of course, be realised that this broad classification

leaves opportunities for pronounced local differences, particularly in the glaciated region.

Climate.—The absence of mountain barriers in the Russian Platform between the Arctic and the Black Seas allows the free passage of winds from north to south, so that climatic conditions do not vary with latitude as much as might be expected. Nor do the Urals form a climatic divide between European and Asiatic Russia, and the

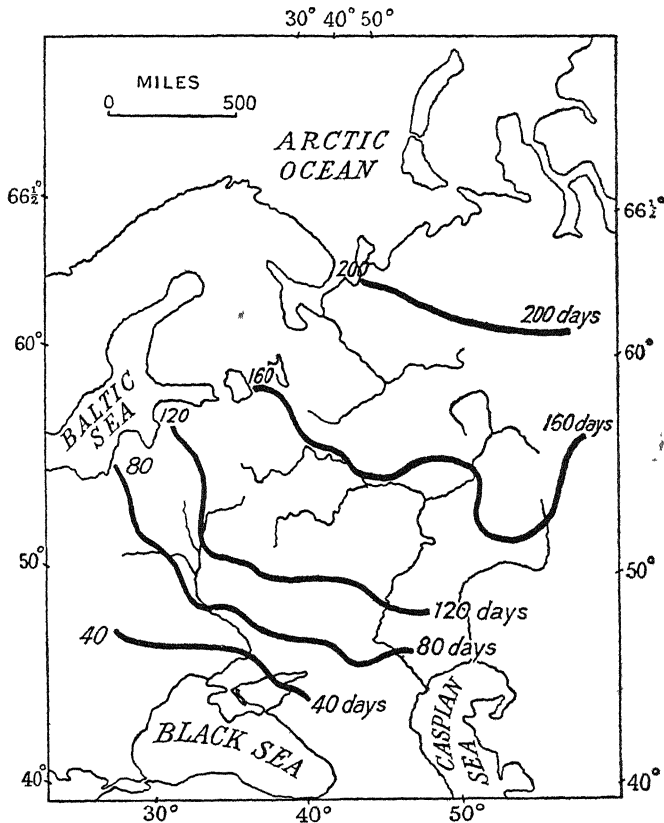


FIG 99—AVERAGE DURATION OF SNOW-COVER IN EUROPEAN RUSSIA

very extreme climate of northern Asia has its influence on the adjacent plains of Russia.

Although the most continental part of Europe, Russia is sufficiently affected in winter by the warming influence of the Atlantic Ocean and Mediterranean Sea for its winter isotherms to run from north-west to south-east, that is to say, for winter cold to increase towards the north-

east. The whole region has January temperatures below freezing except for the southern part of the Crimea, and the differences in the winter climate of the north and south of Russia lie less in the degree of intensity of the frosts than of their duration (See Chapter II)

The terror of the cold has on the whole been much exaggerated. Winter, in fact, was an important time of movement, three of the main fairs being held at that season (*i.e.* Kharkov in January, Kiev and Irbit in February), and winter was the season of the chase. Many of the drawbacks of the winter climate were due to the backwardness of the Russians, as the following quotation from an American engineer shows "Until the winter of 1929-30 no construction work of any consequence had ever been attempted in Russia during the four or five coldest months of the year. Whenever this subject came up for discussion the Russians would invariably point to our mild 'Italian' [*sic*] climate as they called it, as not being a criterion to go by. And so it fell to the lot of the dwellers of an 'Italian' climate to demonstrate that work can actually be done successfully at sub-zero temperatures. By completing all foundation and other concrete work before the onset of severe weather it was proven that steel erection, carpenter, sheet metal, sash, roof, and other work can just as well be done there in the winter as in the United States. The Stalingrad experiment has proven the feasibility of winter work in that country" (A. L. Drapkin, Resident Engineer at the Stalingrad Tractor Plant during its construction, in *Pencil Points, A Journal for the Drafting Room*, Vol. XI, No. 6, New York).

In summer, on the other hand, differences in temperature from north to south are considerable (*see* Chapter II), and it is the differences in the summer climate and in the duration of the growing season that give rise to the various vegetation belts.

In the absence of any marked diversity of relief there is no very satisfactory basis for a detailed regional subdivision of Russia. The great river basins could be taken as the units, but these have very indefinite watersheds and do not coincide with any of the other distributions, such as climate, vegetation, and so on.

The broad division into vegetation zones forms an obvious line of approach, provided it is understood that the boundaries are rather indefinite, and that the work of man has modified them to a considerable extent. Also

conditions naturally vary from one place to another inside these wide zones

The Northern Zone of Tundra and the Northern Coniferous Forest—This zone is undeveloped and scantily peopled and is mainly drained to the Arctic Ocean by the

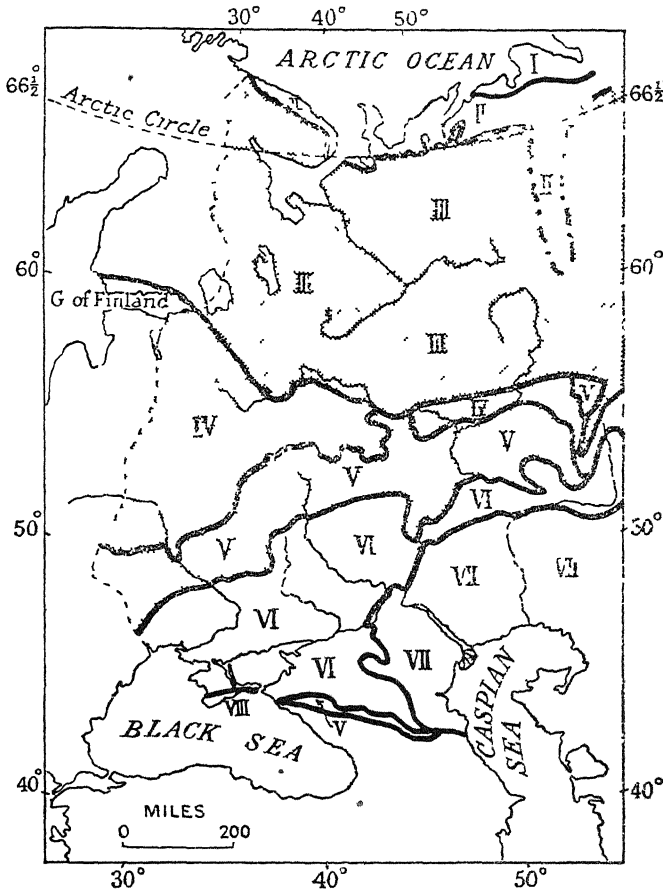


FIG 100—MAJOR VEGETATION ZONES OF EUROPEAN RUSSIA

I, Tundra, II, Forest-Tundra, III, Coniferous Forest, IV, Mixed Coniferous and Deciduous Forest, V, Forest-Steppe, VI, Steppe, VII, Semi-Desert; VIII, Mediterranean

Onega, Dvina, Mezen, and Pechora Rivers. These rise in the low swelling sometimes known as the North Russian Ridges which run from east to west about 60° N. The drainage area of the Kama tributary of the Volga also lies

in this zone, though here there are also patches of steppe, while conifers clothe the Urals to their southern end at about 51° N, though their northern end lies in the tundra zone and tundra prevails on the higher parts as far as about 57° N.

The Arctic drainage zone is disputed between tundra and coniferous forest. North of the Arctic Circle tundra has almost undisputed sway and also prevails over the higher parts of the low Timan Mountains, which stretch in a north-westerly to a south-easterly direction and form the western watershed of the Pechora River. The tundra is occupied by a few thousand Samoyeds, who spend the summer near the sea, but drive their reindeer southwards in winter to the edge of the forest, whose northern margin they have caused to retreat somewhat through their use of the wood for fuel. The forest zone reaches the coasts of the White Sea and of the Gulf of Onega. Here, at the mouth of the Dvina, is situated Archangel (Russ., Archangelsk; 194,000),¹ the only town of any size in this boreal part of Russia. The White Sea is free from ice and accessible to shipping only for a few months in summer, but since the discovery of this route by the English in the sixteenth century it has proved a useful line of egress for Russian commodities, to-day especially for the timber, which is cut in this zone in vast quantities and floated down the rivers of the Dvina system to this port. Archangelsk is connected by rail with Moscow and the Leningrad-Perm trunk line. Another line, very difficult to maintain across the frozen soil, was made to Murmansk in the north of the Kola peninsula during the Great War. Apart from these railways and a line joining Kotlas on the upper Dvina to the trunk line mentioned above, all the transport of this great area of half a million square miles is by means of the rivers, which are navigable nearly to their sources, but which are frozen for more than half the year and flow to a sea which is entirely blocked by ice in winter and encumbered with icebergs and floes in the short summer. Very little agriculture is carried on in this region, and it will probably be more profitable to keep it under forest, though in similar latitudes and altitudes in Finland and Scandinavia agriculture is practised.

The Central Zone of Mixed Forest.—The southern margin of the coniferous forest lies about the latitude of Leningrad (60° N.) in the west, but drops to 57° in the

¹ Population figures are estimates for 1933.

eastern part of the plain. South of this comes the zone where deciduous trees are mingled with the conifers though this belt becomes very attenuated under the severe climatic conditions of eastern Russia and yields not only to the coniferous zone, as seen above, but also to the grassland zone which encroaches from the south. The result is a wedge-shaped zone of mixed forest with its broad base to the west and its apex near Kasan (55° N.) on the Volga, though patches continue farther east. The southern limit of the mixed forest zone follows a wavy line from Kasan south-westwards to Kiev (50° N.), though a belt of forest steppe forms the transition to the true steppe.

It is in the zone of mixed forest that the heartland of Russia lies. The northern coniferous belt was and is too unfavourable a habitat, the southern grasslands were repeatedly overrun by invaders coming through the Ural-Caspian gap, whereas the mixed forest zone, roughly in the latitude of the British Isles, afforded arable and pasture land in the clearings and timber for fuel, furniture, and building. As in the similar mixed forest belt of southern Scandinavia, the deciduous timber, which usually grew on the better soils, was cleared first, whereas the conifers which grew chiefly on the sandy soils were often allowed to remain. The forests themselves offered difficulty to penetration on the part of the invading nomads accustomed to open spaces, and in addition the Russians constructed great artificial thickets of timber as defences in this land which lacks natural defensive sites. Although there is a sameness of aspect over the whole region, yet the alternation of forest and cultivation, of grassland, woodland and glades, and the presence of many peaceful rivers give the landscape a quiet charm in the summer months, though the cold, snowy winters make it inhospitable at that season. The region is drained principally by the upper Volga, together with its great feeder the Oka (itself as long as the Elbe and draining a larger area), and by the upper Dnieper. The Dnieper flows to the Black Sea, but the usefulness of the Volga is much impaired by its flowing to the inland Caspian Sea, which has no outlet to the ocean. The water-parting between them lies on a broad up-swell, whose height in general does not exceed 800 feet, and which runs from north-north-west to south-south-east, but is only hilly even in the Valdai Hills which form its highest part. These hills, which reach just over 1,000 feet high, are formed of

accumulations of coarse material from an end-moraine of the great ice-sheet

As in the northern coniferous forests, a good deal of the land is swampy owing to the disturbance of the drainage by the deposits of the Ice Age, but where reclaimed provides good, though heavy, soil. Elsewhere the soil varies from the light sands of fluvio-glacial origin to heavy clays of the ground moraine, but the heavy soils are apt to be sticky and difficult to work in latitudes where a little rainfall goes a long way. The 20 to 24 inches received in this zone is much the same as in eastern England, but



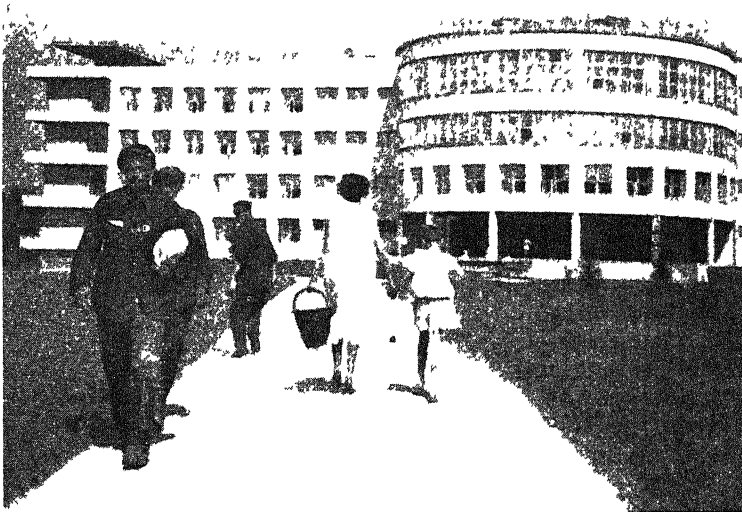
FIG 101 —OLD MOSCOW—THE KREMLIN FROM THE RIVER MOSKVA.

Note the strong Byzantine influence in the architecture

the increased heat of summer (Moscow 66° F. in July) is offset by the soaking which the ground receives in the late melting of the winter snows. Moscow at Easter is usually colder than English towns of the same latitude, say Newcastle, at Christmas, so that the growing season begins very late, for the soil is at first too wet to work, even when the snow has melted. Winter crops are, of course, absent, though the moderately warm summers make up to some extent for the shortness of the growing season. The average rainfall of the summer months is about the same as that of the eastern counties of England; June,

July, and August being the wettest months of the year in Russia, generally with over 2 inches of rain in each month. In contrast to the prairies of southern Russia the mixed forest zone is not very suited to cereals; in fact, there is a deficit, especially marked in the northern parts. Grass and forage crops, root crops such as potatoes, flax, and soft fruits all do well and there is a considerable amount of dairying.

The greatest development in Russia of town life and



[Courtesy Society for Cultural Relations with the U S S R]

FIG. 102 —NEW BUILDINGS AT GORKI (NIJNI-NOVGOROD)

Note the strong Central-European influence in the architecture

manufactures has taken place in this zone, though according to West-European standards towns are small—with the exception of Moscow (3,663,000) and Leningrad (2,776,000)—and widely separated. Moscow, the present capital, is situated on the Moskva tributary of the Oka, already mentioned as one of the mighty tributaries of the Volga. Although 2,000 miles from the mouth of the Volga, the Moskva at Moscow is a broad river some 120 yards wide. The whole river system of the Volga was invaluable to the development of Russia in the early days of its history, though there is now a network (not

very close) of railways focussed upon Moscow. As with most cities of the great plains, there seems to be no reason why Moscow should be situated exactly where it is, but it is fairly central for the mixed-forest zone which formed old Russia before the sixteenth century, when the Tartars still held the grasslands, and it is also centrally situated in European Russia as a whole. It succeeded Kiev as the chief town in Russia in the thirteenth century when the latter was conquered by the Tartars, and was itself superseded as capital by Leningrad (St. Petersburg) from the early eighteenth century to the Revolution of 1917, when it was once more chosen as the administrative centre. Moscow is also a manufacturing town, with various industries, including textiles, leather and iron goods, paper, pottery, etc.

A number of smaller towns within 150 miles radius of Moscow also possess manufactures, developed originally from the home industries carried on by the peasants during the long winters. The Kaluga-Tula coalfield produces some 4.9 million tons of coal per annum and has played a considerable part in the development of industry. The most important of these towns are Tula (200,000), which manufactures cutlery and other iron and steel goods, Tver (now Kalinin, 145,000), and Yaroslavl (167,000), both situated on the Volga to the north of Moscow, Kostroma which manufactures textiles, and Ivanovo-Vosessensk (189,000), to the south of Yaroslavl.

Near the south-western and north-western corners of this triangular zone of mixed forest are Kiev and Leningrad respectively. Kiev (539,000) on the Dnieper was an old town when Moscow was young, and was the chief point of contact between Russia and the fountain head of its civilisation, Constantinople. At Kiev, Byzantine influence was strong, but the exposed position of the town on the edge of the grasslands laid it open to attacks by the nomadic Tartar invaders, to which it succumbed, though it later revived as a religious, educational, and commercial centre. Leningrad, situated on the Neva River near its mouth in the Gulf of Finland, was founded by Peter the Great in 1703 to give Russia a "window" looking out to western Europe or a "door" for the exit and entry of goods. Since the loss of the Finnish, Estonian, Latvian, and Lithuanian areas this is the only port of Russia on the Baltic, but since its desertion as capital, which took place partly on account of its association with the Czars

and partly as a gesture of rejection of West-European influences, it has lost in importance to Moscow.

With the exception of Moscow and the industrial towns mentioned above, most of the urban centres of this region were market towns, and in this capacity they have all declined in importance since the Revolution, and more especially since the abolition of private trading deprived them of their function. Some of them were interesting for their old associations, such as Novgorod on the River Ilmen south of Leningrad, an old settlement and trading town of the Scandinavians, and Nijni-Novgorod (now Gorki), near the eastern apex of the mixed forest zone and at the junction of the Oka with the Volga. The latter town was noted for its great fairs and was a great meeting-place of the old settled parts of Russia with the newer lands east of the Volga, including western Siberia.

The Southern Zone of Grasslands.—(i) *The forest-steppe.*—The zone of mixed forest merges into the grasslands by means of the forest-steppe zone. Woodlands of oak and other deciduous trees still flourish on the moister soils such as occur along the river valleys, while wide expanses of rich prairie extend between. In its natural state, as seen to some extent in the mowing meadows, the grass grows waist high and is thickly interspersed with flowers, but in general the surface is devoted to cereals and such crops as sugar beet, hemp, tobacco. This area, on account of (a) its nearness to the old settled region of central Russia, and (b) its good soils, good supplies of wood and water, was the first of the grassland areas to be settled, and carries the highest population per square mile of any part of Russia, apart from the Moscow district.

(ii) *The true steppe.*—This belt borders the Black Sea, with the exception of the Yaila Mountains of the Crimea, and passes south-eastwards into the semi-desert and salt desert of the Caspian depression. The whole zone trends from south-west to north-east, and its south-eastern boundary coincides more or less with the line of the Volga from Saratov southwards to Tsaritsyn (now Stalingrad) and with that of the Ergem Hills, which continue the line of the high west bank of the Volga southwards. Between Saratov and Kasan the grassland continues across the Volga and reaches the Urals.

This is the great cereal-producing region of Russia, and has been slowly colonised during the past three hundred years by agriculturalists from central Russia, who began

to till the rich Black Earth on which the Tartars had pastured their flocks and herds. The real value of these prairies became apparent, however, only in the middle of the nineteenth century, when the great demand for wheat arose in industrial Great Britain, and southern Russia became the first of the great exporting grasslands of the world. The exported grain came from the southern portion of the belt nearest the Black Sea, the more northerly parts of the steppe zone sending their surplus to the deficit areas of the forest zone. Since the Revolution the great grain exports for which Russia



Photo B Keller]

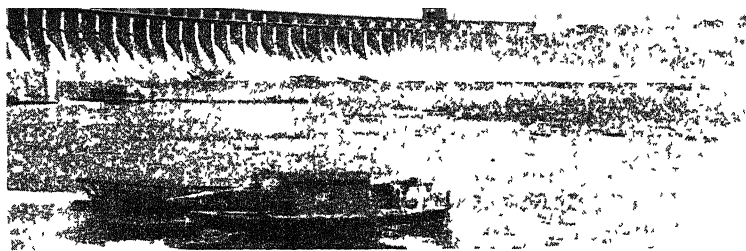
[From the Journal of Ecology by permission of the Editor

FIG 103 —MEADOW STEPPE (MOWING MEADOW) WITH ALDER
THICKET IN THE DISTANCE GOV VORONEZH

had formerly been famous have largely ceased, except for an occasional exceptional year such as 1930. Wheat, rye, barley, and oats are the principal cereals grown, though the area under rye is declining with the growing Russian taste for wheat. Maize is widely cultivated in the warmer southern part of the zone north of Odessa. Tobacco, sunflowers (for the seed), and melons of various kinds are widely cultivated.

It seems likely that the steppe region west of the Volga will also become the main industrial area as well as the main agricultural area of Russia. The Donetsk coalfield, situated in the great bend of the Donetsk River, covers an area nearly equal to that of all the British coalfields

combined, and though its reserves are not known with any certainty, estimates are constantly increasing and the coalfield has already been proved to be one of the greatest of the continent. It lies, however, in a region of scanty settlement, on the southern margin of the loss belt, where the loss covering is already thin and patchy and the vegetation generally poor steppe. The Donets River itself, which borders the coalfield, is a steppe stream with little water and to all intents and purposes unnavigable, and the coalfield itself is far from the established centres of industry. Small wonder, then, that in backward Russia it was little developed until very late in the nineteenth century. The production in 1934 was sixty million tons



[Photo Lettice Ramsey]

FIG 104 —THE GREAT DAM AT DNEPROPETROVSK (EKATERINOSLAV)
ON THE DNIEPER

or about two-thirds of the total coal production of the country. Many other minerals are found in the same region, such as iron, lead, silver, zinc, and salt. A number of small mining and manufacturing towns have grown up here, of which the largest are Stalin (formerly Yuzovka, 286,000) and Leyansk (71,000).

Rather less than two hundred miles from the western end of the coalfield lie the considerable iron deposits of Krivoi Rog, while further deposits, though at great depth, have been discovered by borings north of the Donets coalfield in the government of Kursk (Central Black Earth region). Manganese ore exists in large quantities near Nikopol. The mineral wealth of southern Russia is indeed only just beginning to be known, and a considerable

industrial development, particularly metallurgical, is taking place. Even water-power is not lacking, the rapids of the River Dnieper, where it cuts through the granite plateau, having been utilised by a great dam and hydro-electricity works at Dnepropetrovsk (formerly Ekaterinoslav, 379,000), which has also a considerable iron industry.

The other towns of any size are mainly old administrative centres and market towns. Kharkov (654,000), the capital of the Ukraine, has also important manufactures of sugar, tobacco, linen, and machinery and benefits from its nearness (about 120 miles) to the Donetsk coalfield.

Along the River Volga itself are a number of fair-sized towns, as would be expected along a great river in a region scantily supplied with railways. Kasan (259,000) is still in the forest belt, for the river emerges into the grasslands near its junction with the Kama. South of Kasan, however, the Volga banks do not offer many suitable sites for towns, the western bank being formed by a great cliff, which attains a height of more than a thousand feet over long distances, while the eastern bank is very low-lying and liable to floods. Samara (now Kuibishev; 259,000), however, lies on the east bank at a point where the Volga has made a great bend to the east and has incised itself slightly. Near Samara the transcontinental railway line from Moscow bifurcates, one branch continuing north-eastwards across the Ural Mountains to Siberia and the other south-eastwards to Turkestan. Saratov (328,000) lies on the high western bank and had considerable trading and industrial importance. The region east of the Volga here carries little cultivation and is mainly very poor steppe, while at Tsaritsyn (now Stalingrad; 388,000), noted for its great tractor factory, the river enters the semi-desert wastes of the Caspian depression.

Towards the sea coast the loose soil becomes thin and patchy and the underlying solid deposits of Tertiary age show through. These are generally fertile and under cultivation, but the outcrops of limestones coincide with stretches of waste land.

The actual coasts of the Gulf of Odessa and Sea of Azov are edged with sand-spits (of *cordon littoral* and *nehrung* type), which greatly impede navigation. The river mouths were formerly accessible to the sailing vessels of ancient and mediæval times, but Viernoleninsk (141,000, formerly Nikolaiev), on the Bug, is one of the few river harbours still available, and this only by large expenditure.

The Crimea Peninsula.—This consists of two unlike portions. The northern part resembles the lands to the north of the Gulf of Odessa and is a low Tertiary plateau with a scanty covering of loss. It is a dry, treeless region formerly devoted to pasture and only in recent years has it been partly brought under cultivation. Along the south-eastern shore of the peninsula runs a range of high mountains, the Yaila (Turkish for "summer pasture") Mountains. These belong to the Alpides system and appear to continue the line of the Caucasus Mountains.



Photo B Keller]

[From the *Journal of Ecology* by permission of the Editor

FIG 105 —THE FLAT PLAINS OF SOUTHERN RUSSIA.

Fallow land beyond the vehicle.

The middle slopes carry considerable forest. Along the sheltered southern side of these mountains lies the "Russian Riviera," a region of hot, dry summers and rainy, relatively mild winters. Yalta (now called Krasno-arminsk) on the coast has a mean January temperature of 38.4° F., whereas Simferopol on the northern side of the mountains has a mean temperature for the same month of 30.5° F. The vine and other delicate fruits flourish here. It was formerly very popular as a winter resort with the Russian nobility, whose villas and mansions have been turned into convalescent homes and similar institutions for Soviet workers.

The Caspian Depression.—This region is a flat, low-lying area, mainly below sea-level. The rainfall is insufficient for the cultivation of crops, being generally below 10 inches, and as low as 6 inches at Astrakhan. The steppe vegetation, however, generally provides fair grazing land for sheep, goats, and camels. A good deal of the region is salt steppe, and shallow, usually seasonal, salt lakes are numerous. Where irrigation water can be obtained a great variety of crops can be grown in the great heat of summer (Astrakhan, July, 77.9° F.), but the equally great cold of winter debars fruit-trees and other perennials (Astrakhan, January, 19.0° F.). The Volga between Stalingrad and Astrakhan flows in a much braided course, and here and in its delta provides much water for irrigation. The Ural River, the only other river which reaches the sea, flows in a slightly incised course and the water is accordingly difficult to utilise. Astrakhan (225,000), on one of the distributaries of the Volga, has considerable fisheries (for sturgeon), and is a shipping and commercial town. Orenburg (145,000) and Uralsky lie on the wetter northern margin of the depression, the former being once the starting-point for caravans to Turkestan, and now on the railway.

The Foreland of the Caucasus.—On the southern side of the Manych depression lie some of the newest grainlands of Russia. The land bordering the Caspian Sea, it is true, forms part of the low-lying steppes of the Caspian depression and is suited only to grazing, but farther west, round Stavropol (61,000) and towards the Black Sea coast round Ekaterinodar (now Krasnodar, 219,000), much land has been recently brought under cultivation, principally for wheat and similar cereals. The plateau of Stavropol is composed of Tertiary rocks and reaches a height of nearly 2,000 feet, but sinks on all sides, even on the south, and is separated from the Caucasus Mountains by a sub-montane depression. In the northern foot-hills of the Caucasus great deposits of petroleum occur (*cf.* the Carpathians), which are easily the most important in Europe and among the greatest in the world.

The Ural Mountains.—This isolated range stretches for 1,500 miles from north to south, but is seldom more than sixty miles wide and often less. The average height is in the neighbourhood of 3,000 feet, and the land-forms are similar to those of the Hercynian horsts, which, indeed, the Ural range also resembles in its geological

history, for although its folds were formed in late Palæozoic times, its present existence is due rather to later epeirogenic uplift. The western side of the Ural Mountains sinks gently down to merge with the unfolded Russian Platform, but the eastern side drops abruptly to a low-lying foreland, which, however, is also formed of folded Palæozoic rock. The low central Urals, which seldom exceed 2,000 feet and contain passes at a height of about 1,300 feet, form the main gateway from European Russia to Siberia. Three railway lines cross the Urals, the Trans-Siberian crossing the southern Urals *via* Zlatoust, a second line farther north *via* Ekaterinburg (now Sverd-



Photo B Keller]

[From the *Journal of Ecology* by permission of the Editor

FIG 106 —THE ERGENI HILLS BORDERING THE CASPIAN DEPRESSION
Salt Steppe in the foreground

lovsk), and a third some 150 miles farther north. The central part of the Urals is also the richest in mineral wealth, which has attracted settlers to this otherwise very scantily peopled area. The platinum mines near Nijni Tagelsk form one of the world's chief sources of supply of this mineral. Large deposits of iron occur in the eastern foreland, and the ore is manufactured by means of charcoal at various towns, of which Sverdlovsk (401,000) is the largest.

Economic Summary.—The economic geography of Russia presents a unique picture in that all agriculture, industry, and commerce are in the hands of the state and all the land is state-owned. The state itself consists

of a federation of republics, each nominally governed by a number of soviets, or workers' councils, which send delegates to the Soviet Congress in Moscow, but actual power is in the hands of the Præsidium of the Central Executive Committee, a small and completely autocratic sub-committee.

It may be said that, in theory, Russia has undergone a process of "rationalisation" similar to that recently adopted by some of the great manufacturing companies of western and central Europe and of North America, but among other differences, in Russia the process involves a whole country of seven million square miles and 147 million people (including the Asiatic section), and no one is allowed to leave the firm. Such a process of rationalisation, known as state socialism when applied to a whole country, would tax the best brains of a land where the level of education stood high and whose leaders had already had long experience of organisation. There is no need for wonder, therefore, that the new system, introduced in 1917, resulted for many years in a great falling off in production, even though the pre-War level was already very low in comparison with those of the countries of central and western Europe.

This decrease in productivity may be attributed more particularly to four causes : (i) the disturbances of the civil war which followed the establishment of the new régime, (ii) the large amount of time and energy consumed in establishing the new system and in experimenting with different methods of collectivism, (iii) the loss of talent involved in the suppression and persecution of "intellectuals," and (iv) the difficulty of obtaining capital for a country which had repudiated its former debts. The production level of 1913 was practically re-attained in 1930, according to Soviet statistics, but in the interval the population suffered great miseries from the prevailing shortage of clothing, fuel, housing, and of the other necessities of life.

It must be remembered, however, that conditions of life in Russia at the end of the nineteenth century had changed very little since the Middle Ages, that the standard of living was very low, and that privations which would have been regarded as intolerable by people of western Europe were borne by the majority of Russians with docility. Indeed, it was only in 1861 that the mass of the Russian people ceased to be serfs, and in the early years of the twentieth century the old three-field system of agriculture

was only beginning to break down, while hand industries were still numerous and factory industries few. It may be said without exaggeration that the ideas of the French Revolution, of the Agricultural Revolution, and of the Industrial Revolution reached Russia at much the same time. In the ten years or so before the Great War the stirrings of new life were apparent and the country was being slowly reorganised on western lines. Agriculture was then, as it still is, the staple industry of Russia, but was in a very backward condition, except on the estates of the great landowners, which were situated mainly in the Black Earth belt. Even where enclosures had taken place the peasants were not in a much better position than before, owing to the smallness of their holdings, their primitive implements, and their ignorance of modern methods of tillage. As regards manufacturing industries Russia has a good natural endowment of motive power (particularly of oil and coal) and of raw materials (particularly of timber and iron ore), though such was the undeveloped state of the country that the full extent of these resources, even in the European part of Russia, is only just becoming known. Russia also possessed a vast home market, protected by an almost exclusive tariff wall, and vast supplies of very cheap labour, but was handicapped by lack of capital and until the last years of the nineteenth century by the instability of her currency. The handicap of illiteracy was strongly felt both in agriculture and in the manufacturing industries, and even with the recent great efforts made to "liquidate" illiteracy, only 56 per cent. of the total population were returned as literate by the census of 1926, though the figure is somewhat greater for the European section of the country. It may here be mentioned that one of the difficulties in describing the economic position of the European portion of Russia lies in the fact that the organisation of the country largely ignores the inter-continental frontier, the Russian Socialist Federated Soviet Republic, which is the main unit of the U.S.S.R. (*i.e.* Union of Socialist Soviet Republics), also including the greater part of Siberia.

As regards agriculture, two main changes have taken place in recent years. First, the introduction of what are considered to be American methods, and secondly the abolition of private farms and the substitution of "collective" and state farms. In regard to the first.

however, an American writer considers that the methods have been misunderstood, as the widespread use of farm machinery in the United States was necessary in order to offset the shortage of man-power, whereas in Russia there is no shortage of labour, rather the contrary. It would seem, therefore, that attempts to make farming more and not less intensive would meet with more satisfactory results. The abolition of single-owner peasant farms proceeded at such a rate from 1928 onwards, that although in 1930 peasant holdings amounted to 86 million hectares, only 22 million hectares, or 20 per cent. of the total area under cultivation, remained to them in 1934.

The following tables give the area under certain crops and the amounts exported in recent years compared with the period 1909-13, which was by no means a favourable quinquennium, as it included a famine year

AREA IN MILLION HECTARES ¹

	Average 1909-13	Average 1926-30	1934	1937
Wheat	29 95	30 4	35 2	26 1
Rye	25 1	26 9	24 0	23 4 (1935)
Oats	16 7	17 4	18 0	17 5
Barley	10 5	7 4	8 4	8 1
Flax (fibre)	1 3	1 4	2 1	2 1
Potatoes	4 4	5 6	6 1	6 8
Maize	2 1	3 5	3 7	2 7

¹ A hectare = 2 47 acres

EXPORTS IN THOUSAND QUINTALS ¹

	1909-10 to 1913-14	Average 1926-30	1934	1937
Wheat	43,500	8,700	2,118	8,457
Wheat flour	1,001	141	518	572
Rye	6,733	2,469	998	2,043
Oats	10,228	953	1,414	62
Barley	37,719	4,248	1,817	2,206
Maize ²	7,629	922	1,257	0
Flax ²	2,827	632	913	345

¹ A quintal = $\frac{1}{10}$ th of a metric ton.

² 1909-13.

As the years previous to 1928 showed smaller acreages it will be seen that the area under the leading cereals only caught up with pre-War figures in 1929 or 1930. Similarly the grain exported approached pre-War levels only in the season 1930-31. It seems doubtful whether there will ever again be a large surplus of cereals from Russia unless the Asiatic lands can be more successfully tapped, for the natural increase in population will make increasing demands on the home-food supplies, especially if the policy of setting up large-scale industries is successfully carried out.

The rapid industrialism of the country is part of the programme of the "Five Year Plans," the first of which was inaugurated in 1928. The avowed intention is to make Russia independent of foreign manufactured goods, and as far as the material sinews of industry are concerned the project seems capable of realisation, especially with the aid of the Asiatic lands of Russia. The coal resources of European Russia are not so great as those of Asiatic Russia, as the following table shows, but none the less are very considerable and the output from them at present is greater.

COAL RESERVES AND OUTPUT (In millions of metric tons¹)

	Reserves (estimated 1934)	Output	
		1928-29	1934
Donets	71,088	30.9	60.0
Central (Tula)	5,930	1.3	4.9
Urals	5,038	2.4	5.6
Pechora	60,000		
Siberia—Central Asia	1,077,890	3.0	20.9

¹ A metric ton = 0.98 of an English ton

According to recent investigations, Russia is also well supplied with iron ore, though the estimates are still very vague. For instance, the Kursk iron ores in the Central Black Earth region are estimated at from 20,000 million tons to 40 million tons, those of Krivoy Rog and Kerch also at very large figures, and the iron content of the known ores is said to be from 45 to 50 per cent. The total output of iron ore in 1936 was 28.2 million tons. As regards

production of pig-iron, Russia held the third place in the world in 1938, with a total of 15.0 million tons, and also third place in regard to steel with 18.2 million tons, though some doubt has been cast on the quality of the output.

Russia's large resources in mineral oil are well known. The oil deposits along the flanks of the Caucasus Mountains are among the greatest in the world. Russia is now the second producer of oil in the world and furnished 29 million metric tons in 1938, or about 10 per cent of the world's total.

In regard to the supply of other raw materials, it is difficult to assess the wealth of metals other than iron, as these occur mainly in the Ural and Caucasus Mountains, both of which are largely unsurveyed geologically. In regard to agricultural raw materials Russia possesses potentially large resources in leather and wool, and actually large resources in flax and cotton, the latter in Turkestan. The great timber resources have already been mentioned.

The first "Five Year Plan" in addition to making arrangements for the increased output of raw materials also planned the construction of some 2,000 new factories to manufacture many different categories of goods. For instance, automobile and glass works were erected at Nijni Novgorod, metallurgical works on the Donets coalfield, also at Kerch, Krivoi Rog, and Rostov-on-Don, chemical works, particularly for fertilisers, in the Ukraine and at Moscow, also paper, cotton, railway-carriage factories, and many more. Completely new towns were also brought into existence, *e.g.* Novoye Zaporozhe in the Ukraine and Magnetogorsk in the Urals, both of which numbered over 150,000 people in 1933. This industrialisation has resulted in a considerable increase in the urban population, which numbered 19 per cent in 1930 as against about 14 per cent. in 1912, but the "Plan" itself was not always completed, largely owing to the absence of trained workers, and a second Five Year Plan was initiated in 1933. Considering that only 3.4 per cent. of the total population was engaged in industry in 1926 (census figures), the development of the "Plan" necessarily involved taking on raw hands with no experience of machinery, and the supply of foremen and managers was also very inadequate.

Owing partly to the undeveloped state of Russia and partly to the great variety of its resources, external trade

does not reach high figures ; in fact, both before and since the Great War the external trade per head of population was usually the lowest in Europe. The exports at present consist chiefly of timber and petroleum, with the addition of grain (chiefly wheat) and butter.

REFERENCES

" États de Baltique, Russie," Tome V, of *Géographie Universelle*, by P Camena d'Almeida (Paris, 1932), gives a full account

" Russia Territory and Population A perspective on the 1926 Census," by B Semenov-Tian-Shansky, *Geog Rev*, Vol 18, 1928

" Distribution of Vegetation on the Plains of European Russia," by B A. Keller (*Journ of Ecology*, Vol 15, 1927) Among the vast literature on the economics of Russia the following may be noted. *The Economic Development of Russia*, by M S Miller (London, 1926), *Agricultural Russia on the Eve of the Revolution*, by G. Pavlovsky (London, 1930), *The Economic Policy of Soviet Russia*, by P Haensel (London, 1930), *The Economic Life of Soviet Russia*, by Calvin B Hoover (London, 1931) *The Soviet Union Year Book* contains much useful statistical material

Soviet Geography, by N. Mikhaylov (second edition, London, 1937), gives an interesting account of the recent economic developments in Russia written from the Russian point of view

Atlas of the Leningrad Oblast and Karelian A S S R (Leningrad, 1937), published by the Scientific Research Institute, Leningrad State University, gives a comprehensive picture of the physical, economical, and human distribution of the region concerned

A comprehensive scheme of new topographic maps for the whole of the Soviet Union has been prepared, with series on scales of 1 : 25,000, 1 : 50,000, and 1 : 100,000 Considerable numbers of sheets have already been published.

CHAPTER XXXIII

ESTONIA, LATVIA AND LITHUANIA

THESE three Baltic states were formerly inside the Russian frontier, but obtained their independence after the Great War.

Physically they may be looked upon as forming part of the Russian platform, economically they were bound up with Russia, but the people were non-Russian. The Esths speak a language of Finno-Ugrian affinities, similar to Finnish, while the Letts and Lithuanians speak non-Slavonic Indo-European languages, which are peculiar in showing many archaic characteristics. The racial affinities of these people are obscure, though they possess broad-headed, dark-haired elements intermingled with fair, long-headed Nordic types, the latter being prominent mainly in Latvia. Estonia and Latvia had never been independent since tribal days, for in the year 1200 the "Livonian Knights," a German organisation, began the Germanisation of the country which continued up to the nineteenth century, when Russia began to substitute a Russianising policy. The Germans settled as land-owners and overlords, exploiting the peasants, in consequence of which an acute agrarian problem arose, which resulted in the expulsion of the German "barons" after the Great War and the confiscation of their estates. Lithuania, on the other hand, once possessed an "empire" which extended nearly to the Black Sea, but owing to the union of the country with Poland in the fourteenth century, it also suffered extinction in the eighteenth century when Poland was partitioned among the neighbouring powers. Like Estonia and Latvia it also had an agrarian problem, but here the landowners were Poles.

The physique of this region is somewhat complicated, ground-moraine and end-moraine landscapes alternating with drained lake-basins and even with plateaus of Palæozoic material devoid of glacial covering.

Beginning in the north we have the low plateau of Estland, which attains a maximum height of about 550 feet and falls by means of steep cliffs to the Gulf of Finland.

This plateau, of which the islands of Ösel (now Saare Maa) and Dago (now Hiiumaa) form isolated portions, is composed of unfolded sandstones and limestones of Cambrian and Silurian age respectively. It was swept bare of soil by the advancing ice-sheet during the great Ice Age, and has still only a scanty soil covering. Extensive deposits of oil-shale occur in the Silurian beds and are largely used to generate electrical energy. The capital and largest town of Estonia, namely, Tallinn (147,000), formerly known as Reval, lies on the northern coast of the plateau. It has considerable iron and textile industries and is an important port. On the west coast is the town of Baltisk (formerly Baltic Port), which is practically ice-free throughout the year and before the War was becoming prominent as an exporter of Russian goods.

South of the plateau of Estland lies the depression of Tartu, formerly known as Dorpat (60,000). This is traversed by the River Ema (formerly Embach), which flows towards Lake Peipus. South of this depression, which is filled with glacial sands and gravels, rises the plateau of Livonia, which lies mainly in Latvia. The eastern frontier of Estonia is formed mainly by Lake Peipus, which is drained northwards by the River Narova, near whose mouth stands Narva (24,000), on the 20-foot falls which provide water-power for its industries. Lake Peipus occupies part of the site of a much larger lake which collected in a tongue-basin at the close of the Ice Age. This basin extends on the eastern side of the plateaus of Estland and Livonia as far south as the Dvina River and forms the inner Baltic depression, in which sandy and clayey soils were deposited. Another lobe of ice extended southwards into the Baltic lands on the western side of the plateau of Livonia and occupied the site of the Gulf of Riga and the land to the south in the valleys of the lower Dvina and of the River Aa, and gave a similar fairly fertile soil, though with sandy and swampy patches. The bordering moraines of these tongues of ice coalesced on the Livonian plateau, which consequently has generally infertile soil. Latvia comprises, therefore, the southern ends of these tongue-basins, together with the Livonian plateau between them, and also on the extreme east and west two other regions. A typical piece of end-moraine country lies on the eastern frontier, with numerous lakes and poor forest-covered soils, while on the west is the peninsula of

Courland, a low plateau which is mostly covered with fertile deposits of the ground moraine, though it is crossed in places by narrow bands of end-moraine. Latvia possesses three considerable ports Riga (385,000), the capital of Latvia, stands five miles or so up the Dvina River, but has an outport at its mouth Windau (now Ventspils) and Libau (now Liepāja, 57,000) are both practically ice-free in normal winters, whereas the Dvina mouth is ice-bound for about six weeks in most winters. Ventspils is connected by a direct broad-gauge line to Russia and exports a good deal of Russian produce. Riga is the largest town of the three Baltic states under consideration, and has considerable industries, particularly of timber, textiles, metals, and rubber.

Lithuania consists of four parallel zones trending from north to south. Along the coast is a region of ground moraine, which is followed farther east by a zone of end-moraine on the Samogitian plateau. East of this lies the prolongation of the Riga tongue-basin, which is followed still farther east by a continuation of the Baltic Heights with coarse morainic material and numerous lakes. The southern boundary of the country is formed by the Niemen River, on whose banks stands Kovno, now Kaunas (113,000), the administrative capital of the country, though Vilno in Poland is claimed as the true historic capital. Memel (37,000) at the entrance to the Kurisches Haff was assigned to Lithuania as a port, but retained considerable autonomy. It was ceded to Germany in 1939, but Lithuania is to be allowed a free zone in the harbour.

Economically all three countries must be looked upon as rather backward, especially Lithuania, where the old three-field system of agriculture is still widely practised. Estonia has made great strides since the War and in many ways is as up to date as its neighbour Finland, while Latvia occupies an intermediate economic position. All three countries are mainly agricultural. Lying between 55° N. and 59° N., the region is in much the same latitudes as southern Sweden, but the climate is rather more continental, *e.g.* Riga has a mean January temperature of 22.8° F. and a mean July temperature of 64.2° F. As in Sweden, the climate is more suited to the hardy cereals such as rye, oats, and barley than to wheat. Potatoes, other root crops, and flax are important. The dairying industry has assumed great importance in Estonia in the last few years, and is becoming established also in Latvia.

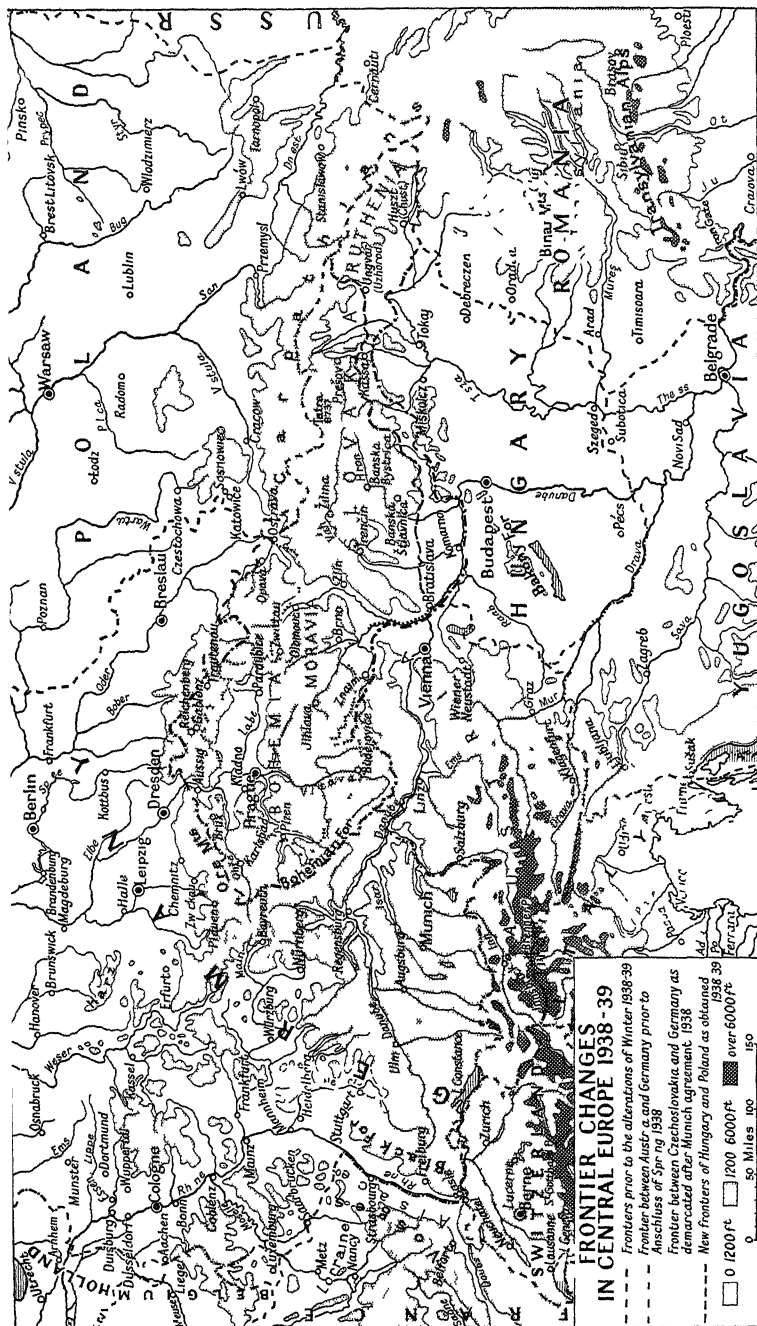
The forest resources of all three countries were large, but owing to the great amount of timber felled during and after the War, the reserves have been much depleted, and the forest cover now amounts only to 21, 23, and 16 per cent. in Estonia, Latvia, and Lithuania respectively.

All three countries are sparsely peopled. Estonia contains a population of just over a million, with 62 per square mile, Latvia has a total of one and a half millions and 76 per square mile, while even Lithuania has only two and a half million people and 114 per square mile, the greater density resulting largely from the more fertile soils.

The main importance of the area in pre-War days lay in its position as a transit land to Russia, owing to the presence of almost ice-free harbours, whereas St. Petersburg at the head of the Gulf of Finland was ice-bound for about three months every year. Since the dislocation of Russia's imports and exports little traffic has been available and the ports have stood for many years almost idle. A few towns, particularly those now in Latvia and Estonia, such as Riga, Libau, Reval, and Narva, had developed industries, particularly textiles, which obtained a ready sale inside the protective Russian tariff wall, but since the countries were declared independent this market has been closed to them and the industries have languished or even succumbed. All three countries export dairy produce, timber and flax. Estonia and Lithuania also export cellulose and Estonia cotton tissues.

REFERENCES

The New Baltic States and their Future, by O. Rutter (London, 1925).
Landeskunde von Eestl, by M. Haltenberger (Dorpat, 1926). *Agricultural Conditions in Estonia*, by E. Vesterinen (Helsinki, 1923).
Statistical Annual of the Bureau of Statistics of the Latvian Republic (in French). See also *The Baltic Region*, by E. G. Woods (London, 1932).



APPENDICES

APPENDIX A

Country	Area in square miles	Population	Date of Census	Population per square mile	Percentage of Population employed in	
					Agriculture and Forestry	Industry and Mining
Albania	10 629	1 003 068	1930	94	?	?
Belgium	11,752	8 092 004	1930	689	19	47
Bulgaria	39 814	6 077 939	1934	153	81	?
Czechoslovakia	54 207	14 726 158	1930	272	40	37
Denmark	16 576	3 706 349	1935	224	35	27
Estonia	18 353	1 126 413	1934	61	66	13
Finland	132 589	3 367,067	1930	28	63	14
France	212 649	41 995 968	1936	197	38	33
Germany	180 985	66,030 491	1933	363	31	41
Austria	32 393	6 760 233	1934	209	32	33
British Isles						
England & Wales	89 041	39 952 377	1931	685	?	47
Scotland	29 796	4 842 554	1937	163	?	?
Northern Ireland	5 592	1 279 753	1937	225	52	15
Ireland	27 000	2 968 420	1936	110	52	15
Greece	50 257	6 204 684	1928	123	54	16
Hungary	35 875	8 688 349	1930	242	58	20
Iceland	39 709	108,870	1930	2.7	56	12
Italy	119 713	42 993 602	1936	359	46	25
Latvia	24 440	1 950,502	1935	78	68	11
Lithuania	21,489	2 392,983	1932	111	79	6
Netherlands	12 579	7 935 565	1930	631	24	38
Norway	124,588	2 814,194	1930	23	35	27
Poland	149,960	31 927,773	1931	213	76	9
Portugal	34,254	6 234 549	1930	182	48	22
Romania	122,282	18 025 937	1930	148	80	8
Russia in Europe	1 769,100	116 000 000	1926	66	87 ¹	6 ¹
Spain	196 607	23 560 975	1930	120	46	21
Sweden	173 356	6 141 571	1930	35	41	31
Switzerland	15 940	4 066 400	1930	255	26	44
Turkey in Europe	9 257	1 266 132	1935	132	?	?
Yugoslavia	96 010	13 930 918	1931	145	76	9

Area and Population figures from *Statesman's Year Book* London

Occupation figures from *Statistical Year Book of the League of Nations* Geneva

¹ In whole of U.S.S.R.

APPENDIX B

LAND UTILISATION (From *International Year-Book of Agricultural Statistics*, Rome)

Country	Percentage of Total Area in 1936 under			
	Arable	Permanent Pasture and Grass	Woods and Forest	Other Land
Austria . .	23 5	26 8	37 4	12 3
Belgium .	34 8	23 2	42 0	
Bulgaria	36 1	3 0	60 9	
Czechoslovakia	41 7	16 6	32 6	9 1
Denmark	61 9	9 9	28 2	
Estonia .	23 9	38 5	20 7	16 9
Finland . .	7 3	2 5	90 2	
France .	38 3	20 9	19 5	21 3
Germany	43 7	17 4	27 3	11 6
England & Wales	23 7	57 0	19 3	
Scotland	15 6	63 1	21 3	
Northern Ireland	33 3	56 3	10 4	
Irish Free State	19 0	49 1	31 9	
Greece .	15 8	?	?	?
Hungary	60 4	17 5	11 8	10 3
Italy . .	41 7	18 8	17 9	21 6
Latvia .	32 2	25 2	26 6	16 0
Lithuania .	48 8	20 5	18 9	11 8
Netherlands .	29 6	39 2	7 4	23 8
Norway	2 7	0 6	24 3	72 4
Poland . .	47 7	16 7	21 4	14 2
Romania . .	47 2	13 1	21 9	17 8
Spain . . .	31 2	?	?	?
Sweden . .	9 1	2 7	54 2	34 0
Switzerland .	12 2	40 7	21 8	25 3
Yugoslavia . .	30 1	25 2	31 2	13 5

" Other land " includes marsh, heath, fallow, and unproductive land
 Figures for Russia not available.

APPENDIX C

COAL PRODUCTION—Metric Tons (In thousands)

Country	1928.	1932	1937
Austria	202	221	230
Belgium	27,578	21,414	29,681
Bulgaria	70	98	120
Czechoslovakia	14,560	10,961	16,951
France	51,780	46,267	44,319
Germany	180,861	104,740	184,513
Hungary	783	895	917
Italy	128	255	969
Netherlands	10,920	12,756	14,321
Poland	40,616	28,835	36,218
Portugal	201	186	283
Romania	398	188	304
Russia (U S S R)	35,808	64,315	122,579
Spain	6,371	6,854	7,017 (1935)
Spitzbergen	279	256	784 (1936)
Sweden	359	333	460
United Kingdom	241,283	212,083	245,053
Yugoslavia	357	370	428

LIGNITE PRODUCTION.—Metric Tons (In thousands)

Country	1928.	1932	1937.
Austria	3,263	3,104	3,242
Bulgaria	1,361	1,663	1,732
Czechoslovakia	20,451	15,858	18,042
France	1,075	986	1,015
Germany	165,588	122,647	184,672
Hungary	6,510	5,931	8,055
Romania	2,630	1,464	1,879
Yugoslavia	4,694	4,431	4,574

APPENDIX D

IRON ORE PRODUCTION —Metric Tons (In thousands)

Country	1928.	1932	1936
Austria . .	1,928	301	1,024
Belgium	164	126	191
Czechoslovakia .	1,779	1,235	2
France . .	49,191	27,563	33,187
Germany	6,296	2,574	6,499
Greece . .	167	236	250
Hungary . .	200	53	280
Italy . .	641	473	839
Luxembourg . .	7,027	3,215	4,896
Norway . . .	531	375	847
Poland . . .	737	77	468
Portugal . .	14	—	6
Romania . . .	84	62	101
Russia . . .	6,024	10,900	27,918
Spain . . .	5,785	1,700	2,633 (1935)
Sweden . . .	4,669	7,071	11,250
United Kingdom . .	11,443	7,748	12,905
Yugoslavia . .	440	27	451

APPENDIX E

HYDRO-ELECTRICITY PRODUCED —In Millions of Kilowatt Hours

	1936
Austria	2,157
Germany	6,835
Finland	11,714
France (1935)	8,164
Italy	13,176
Norway	11,145
Spain (1934)	3,198
Sweden	7,425
Switzerland	10,724
United Kingdom (1935)	620
Yugoslavia	416

APPENDIX F

COTTON SPINDLES INSTALLED
(In thousands)

IMPORTS OF RAW COTTON, 1937
(In metric tons)

Austria	774	39,000
Belgium	2,106	134,000
Czechoslovakia	3,627	105,000
Denmark	100	9,000
Finland	271	15,000
France	10,170	2,831,000
Germany	10,109	245,000
Hungary	283	24,000
Italy	5,493	165,000
Netherlands	1,236	63,000
Norway	48	4,000
Poland	1,696	72,000
Portugal	452	30,000
Russia	9,800	22,000
Spain	2,070	?
Sweden	602	34,000
Switzerland	1,295	31,000
United Kingdom	45,893	752,000

Note —The methods of estimating both spindles installed and spindles active are different in different countries. Moreover, the series take no account of variations in the number of hours worked per spindle or of the differences in the length of the working day.

APPENDIX G

PRODUCTION OF ARTIFICIAL SILK, 1937
(Metric tons)

Austria	1,000
Belgium	7,800
Czechoslovakia	4,200
France	33,000
Germany	65,000
Italy	48,300
Netherlands	10,750
Poland	6,200
Spain	1,000
Switzerland	5,500
United Kingdom	54,300

TABLE OF GEOLOGICAL SEQUENCES

<i>Era.</i>	<i>Period or System.</i>
Quaternary	{ Recent Pleistocene
Tertiary or Kainozoic	{ Pliocene Miocene Oligocene Eocene
Secondary or Mesozoic	{ Cretaceous Jurassic (Liassic) Triassic
Primary or Palæozoic	{ Permian Carboniferous Devonian Silurian Ordovician Cambrian
Archæan or Pre-Cambrian.	

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